FABRICATION ASSEMBLING **METAL INDUSTRY** PLATING FINISHING

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Editorial Comment

The Platers' Silver Jubilee

A MOST heartening affair was the 25th Annual Convention of the American Electro-Platers' Society—The Silver Jubilee Meeting; heartening from every point of view—educational, social and business.

From the standpoint of size alone it ranked at the top. For enjoyability and entertainment it was second to none. Of course, it had the advantage of location, with endless facilities for "parties", but credit is due in full measure for having taken advantage of the best that was available. This convention takes first place in the number and quality of practical papers read. The plater had his "innings" and rightly so! The entire plating industry offers its congratulations to the New York Branch and its Convention Committee for their outstanding job.

Congratulations should also be given in no smaller measure to the practical platers who offered the benefits of their experience to their fellow workers. How impressive this spectacle was can be judged best by the statement of a representative of one of the large European companies, that he was deeply impressed by the calibre of the practical electroplaters present at the convention. He was accustomed to the high grade of technical men, men with college training but he was surprised by the growth in stature, in technical knowledge and in ability, of the practical man in the electroplating industry in the United States.

And that is the job which these men have done for themselves through the medium of their own organization—the American Electro-Platers' Society.

The Lure of Gold

EVER since the price of gold was raised to $35 a boom has been operating in the gold producing and refining industries. Naturally enough this boom has extended to the recovery of gold from scrap jewelry. Metal Industry has received numberless inquiries for methods of recovering gold from jewelry alloys, on a small scale.

In fairness to the small sized jeweler and refiner it must be said at the outset that this idea is a Will-o'-the-Wisp. Alluring as the prospect seems, large as the possible profits appear, it is not practicable to extract gold by electrolytic methods unless the quantities are very large and the flow is steady. In the first place a huge investment is permanently tied up in the equipment, starting cathodes, gold and silver in the solution, electrical machinery, etc. In the next place, in order to pay, the process must be carried on practically from the start, including copper refining, silver, gold and rare metals. Smelting charges may seem high to the small seller of unrefined precious metals but in general they are justified by the costs involved.

For the small jeweler, the most practical commercial procedure is to recover what gold he can by chemical methods and leave the ultimate refinements in extraction to the electrolytic refinery to which he can sell his product.

A clear, brief, explanation of this problem will be found on page 350 of this issue in the article, "Refining a Low Grade Alloy", by Jewelry Metallurgist.

Industrial Danger

WITH all departments of business except the steel industry holding a good steady pace, on a level with the rate of the past few months, we find that, as phrased by the Cleveland Trust Company Bulletin, the second quarter of 1937 has been so far a period of "pessimistic prosperity". A long decline in the security markets and a labor situation which is growing daily more bitter, has spread a gloomy atmosphere. Steel production has dropped to about 75% of capacity from over 90% because of the reduced operations caused by the strikes of the CIO against the independent steel companies.

With summer upon us, it is idle to expect a great volume of business for the next two or three months. The best we can hope for is that declines will be no more than seasonal, and that the Fall will bring up the year to a good gain over 1936. Needless to say, however, this hope will be vain if the warfare in the steel industry continues, as it is of such proportions that it is bound to spread.

At the time of writing, the prospect is not bright.

Electroplaters Meet for Silver Jubilee

25th Annual Meeting of the American Electro-Platers' Society in New York. Educational sessions featuring practical papers. Huge attendance. Prizes, favors and a full program of social events.

THE 25th Annual Meeting of the American Electro-Platers' Society held at the Hotel Pennsylvania in New York, June 14-17 was celebrated in a manner fitting in every way to the occasion. Every part of the program, technical, social and business was planned and carried out on the largest and best scale. The registration totalled 565. The attendance at the banquet totalled 810. The number of guests at the annual Open House Party held by the International Fellowship Club on Monday, June 14 totalled 790.

The Convention opened with addresses of welcome by FRANKLIN J. MACSTOKER, General Chairman of the Convention Committee and RALPH J. LIGOURI, president of the New York Branch. A welcome to New York was extended to visitors by MR. MOSS of the staff of the Mayor of New York.

The Convention was opened by CHARLES H. PROCTOR, Founder of the Society and the Presidential address was made by E. STEEN THOMPSON, president of the AMERICAN ELECTRO-PLATERS' SOCIETY. W. J. R. KENNEDY, Executive Secretary reported that there are now $4,000 in the American Electro-Platers' Society treasury. W. M. PHILLIPS reported on the progress of the Research Committee, showing that it now has $5,000 in the treasury.

PRESIDENT THOMPSON delivered a eulogy of P. J. SHEEHAN, late first vice-president of the AMERICAN ELECTRO-PLATERS' SOCIETY which was followed by a statement from R. M. GOODSELL on MR. SHEEHAN'S work. The attendance then stood for a short period in silence, in commemoration of MR. SHEEHAN.

The Secretary then read the names of other members who had passed away during last year and the members again rose in silence, in their memory.

The Society sent telegrams of good will and wishes for the speedy recovery to WALTER FRAINE, Dayton Branch who is ill and unable to attend the convention and to HEDLEY J. RICHARDS, St. Louis Branch who had been injured in an automobile accident.

New Officers

Almost an entirely new slate of officers was elected for the coming year.

President, A. B. WILSON, Detroit Branch.

1st Vice President, F. J. MACSTOKER, New York Branch.

2nd Vice President, R. M. GOODSELL, Milwaukee Branch.

3rd Vice President, AUSTIN FLETCHER, Binghamton-Elmira Branch.

Executive-Secretary, W. J. R. KENNEDY (re-elected).

Coming Conventions

Milwaukee was awarded the Convention in 1938.

A. B. WILSON
President, A.E.S.

FRANKLYN J. MacSTOKER
1st Vice-President, A.E.S.

R. M. GOODSELL
2nd Vice-President, A.E.S.

An element of surprise was injected into the proceedings when HORACE H. SMITH of the Newark Branch, Past President of the A.E.S., proposed that the 1939 Convention have an international conference on electrodeposition, similar to the conference recently held in London (see Metal Industry, June 1937, page 212-220). Because of the need for holding such a conference in a convenient place for foreign visitors, and because of the World's Fair which would be going on in New York at that time, MR. SMITH asked that the 1939 convention be allotted to the Newark Branch, which would arrange for the convention to be held in Asbury Park, N. J. MR. SMITH'S proposal was warmly seconded by MR. HOGABOOM, MR.

W. J. R. KENNEDY
Executive Secretary, A.E.S.

MEYER and DR. BLUM, and the Society formally accepted his proposal and voted the 1939 convention to the Newark Branch.

Prizes and Awards

The list of prizes and special awards given at the American Electro-Platers' Society is growing steadily. In addition to the Founders' Gold Medal, the American Electro-Platers' Society Medal, the Metal Industry Cup and the three prizes for individual exhibits, a new award was given at this meeting —the Herminie Dorothea Proctor Memorial Award, consisting of a cash payment of $100 established by Charles H. Proctor, Founder of the Society, for the best paper read at the convention.

The winners were as follows:

Founders' Gold Medal—A. B. SPENCER, Detroit Branch.

American Electro-Platers' Society Medal—DR. H. P. COATS, Firestone Steel Products Co., Akron, Ohio.

Metal Industry Cup for the best Branch Exhibit of electroplated work —DETROIT BRANCH.

Individual Exhibits:—

First prize, NELSON F. SIEVERING, Newark Branch.

Second prize, JOSEPH P. SEXTON, New Haven Branch.

Third prize, JOHN H. FEELEY, Montreal Branch.

Herminie Dorothea Proctor Memorial Award—G. B. HOGABOOM, Hanson-Van Winkle-Munning Co., Matawan, N. J.

Trips and Visits

Because of the unusual circumstances and the full program laid out, it was deemed inadvisable to schedule visitations in the industrial plants in the Metropolitan area. However, special trips were arranged for those interested, which included a visit to the Bell Laboratories in New York City, to view the specimens of plated coatings placed there for exposure tests by the Joint Committee of the American Electro-Platers' Society and the American Society for Testing Materials.

Entertainment tours included a trip around New York in the coaches of the Grey Line Motors, Inc., and an inspection visit of the S. S. Normandie which was at anchor in the New York Harbor. One of the outstanding trips was a tour of Radio City and the National Broadcasting Studios.

PAUL M. SAVAGE
Chairman, I.F.C.

AUSTIN FLETCHER
3rd Vice-President, A.E.S.

Fellowship Club Activities

Of entertainment there was full measure and as usual the International Fellowship Club was responsible for some of the best of it. After its annual Luncheon on Monday June 14 at which 79, the largest number in its history, attended, the Club elected officers for the coming year as follows:

Chairman, PAUL M. SAVAGE, McGean Chemical Co., Cleveland, Ohio.

Vice-Chairman, O. J. SIZELOVE, Frederick Gumm Chemical Co., Kearney, N. J.

Secretary-Treasurer, THOMAS A. TRUMBOUR, Metal Industry, New York; (re-elected for the last ten years).

The Open House celebration held on Monday was one of the biggest affairs in the history of the Society with 790 present. The entertainment was most original in character, consisting of a concert by St. Vincent's Band, then a Grand March of the past officers of the A.E.S., led by the band. The evening was then devoted to food, refreshments and dancing.

Sixteen past presidents of the American Electro-Platers' Society attended the convention: Charles H. Proctor, George B. Hogaboom, W. S. Barrows, Oscar E. Servis, S. P. Gartland, J. E. Sterling, F. J. Hanlon, F. C. Mesle, J. H. Feeley, H. H. Smith, George Gehling, Philip Sievering, C. A. Van Derau, H. A. Gilbertson, T. F. Slattery, E. S. Thompson.

Hanson-Van Winkle-Munning Company sponsored a unique contest giving "mammoth" prizes of $5.00 in

guaranteed legal tender to the best news story accepted every day by the editorial staff of their paper, the Hanson-Van Winkle-Munning Official Convention News. The second best received $3.00 and the third $2.00. All Hanson-Van Winkle-Munning employees were ruled out. The prize winners were:

ROBERT STEUERNAGEL, WALTER PINNER, F. W. BERNER, BERT SAGE, WILLIAM GUILFOYLE, A. HIRSCH, JOHN MCCUTCHEON, HORACE H. SMITH and DANIEL WITTIG.

Ladies Program

The Ladies Program was complete in all imaginable ways, not only in point of activity, with every minute taken, but also for the interest and enjoyability of their schedule.

Starting on Monday when they "got acquainted", the program kept them busy steadily throughout the week. On Tuesday the ladies went on the Greater New York tour and a visit to the Normandie. On Tuesday evening

TWENTY-FIFTH ANNUAL (SILVER JUBILEE) BANQUET

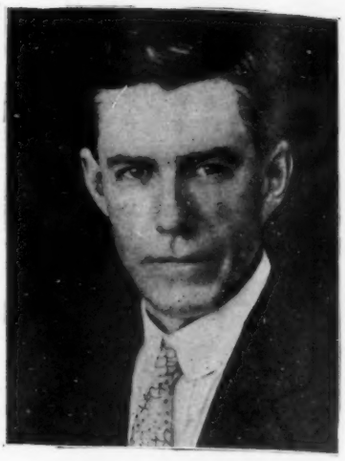
they were taken to a dinner dance and review at the Paradise Restaurant. On Wednesday they went on the Radio City Tour and then to a theatre party. On Thursday afternoon they attended a bridge and card party and had their fortunes told. On Thursday night, of course, they attended the Annual Banquet which was the outstanding social event of the week. The entertainment at the banquet was provided by the Hollywood Review. At the afternoon card party, not only did the ladies have their fortunes told (with a fortune predicted for each one!) but they were entertained by George Morrow, the magician of the Egyptian Lacquer Company, whose monologues and fingers are now nationally famous. Favors and prizes were provided by the Hanson-Van Winkle-Munning Co., Matawan, N. J.; Magnus Chemical Co., Garwood, N. J.; Oakite Products Inc., 18 Thames St., New York; Ultrex Chemical Products Co., 255 Freeman St., Brooklyn, N. Y.; Zialite Corp., 521-5th Ave., New York; Detroit Rex

OF THE AMERICAN ELECTRO-PLATERS' SOCIETY

T. A. TRUMBOUR
Secretary-Treasurer, I.F.C.

Co., Inc., Detroit, Mich; J. B. Ford Co., Wyandotte, Mich.; Egyptian Lacquer Co., 30 Rockefeller Center, New York; Frederic Gumm Chemical Co., Inc., 538 Forest St., Kearney, N. J., Lea Mfg. Co., 18 Cherry Ave., Waterbury, Conn; Anthony Henry, New York Branch, New York; Maas & Waldstein Co., Newark, N. J.; MacDermid Inc., Waterbury, Conn.; Matchless Metal Polish Co., 840 W. 49th Pl., Chicago, Ill.; McGean Chemical Co., Cleveland, Ohio; Roxalin Flexible Lacquer Co., Elizabeth, N. J.; Special Chemicals Corp., 30 Irving Pl., New York; Wilfred S. McKeon, Sulphur Products Co., Inc., Greensburg, Pa.; Udylite Co., 30 E. 42nd St., New York; United Chromium Inc., 51 E. 42nd St., New York; Zapon Division, Atlas Powder Co., 333 Hudson St., New York.

The winners of these prizes were the following: Mrs. Joseph Beloin, Bristol, Conn.; Mrs. Lester D. Cope, Toledo, Ohio; Ruth Friend, New York; Mrs. Ovide G. Hogaboom, New Britain, Conn.; Dorothy Hyduke, Cleveland, Ohio; Mrs. J. J. Knodel, New York; Mrs. John Lockerbie, Goshen, Ind.; Mrs. Marion Longfield, Chicago, Ill.; Mrs. Leon A. Nowak, Buffalo, N. Y.; Mrs. Wm. Papsco, Newark, N. J.; Miss Rose Pelcarsky, Cleveland, Ohio; Mrs. E. Phillips, Fairfield, Conn.; Mrs. Roy S. Stout, Irvington, N. J.; Mrs. Van Winkle Todd, Matawan, N. J.; Mrs. J. Vallier, Toronto, Canada; Mrs. D. Wittig, Milwaukee, Wisc.



O. J. SIZELOVE
Vice-Chairman, I.F.C.

Educational Sessions

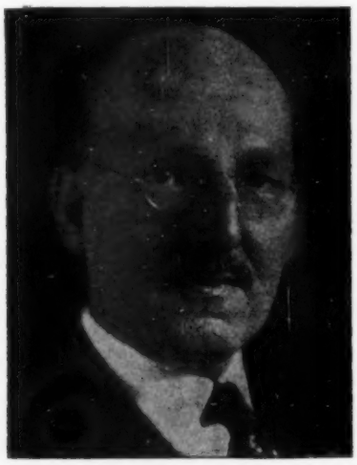
By GEORGE B. HOGABOOM
Hanson-Van Winkle-Munning Co.

The twenty-fifth annual convention of the American Electro-Platers' Society held June 14-17 at the Hotel Pennsylvania had one of the finest technical programs that has been presented in recent years thanks to the efforts of JOHN ROLFF, Chairman of the Educational Committee and assisting members of New York Branch. During five sessions a total of twenty-three papers were presented.

Work of the Bureau of Standards

The opening session at which G. B. HOGABOOM, first president of the A.E.S. presided, started with a paper by DR. WM. BLUM of the NATIONAL BUREAU OF STANDARDS. A review was given of the work being done on electroplating, and much of this is directed toward standardization and specifying and measuring properties of plated coatings. Exposure tests are being made at 6 different locations to determine the reaction of various types of electrodeposits on non-ferrous basis metals. Chromium direct on brass without a nickel undercoat was found to have slight resistance to corrosion. The application of a thin film (estimated .000005" thick) of vaseline had a tremendous preservative effect. There seems to be no doubt that the

A. G. SPENCER
Awarded Founder's Gold Medal



GEORGE B. HOGABOOM
Received Herminie Dorothea Proctor Memorial Award

DR. H. P. COATS
Awarded A.E.S. Medal

NELSON F. SIEVERING
1st Prize for individual exhibit

most important single factor in the protection of a basis metal is the thickness of the deposited coating.

Measuring the Thickness of Coatings

The next paper presented by P. W. C. STRAUSSER, Research Associate of the A.E.S. reported on methods of testing coatings for thickness. The average thickness of a deposit can be obtained by stripping and then either getting the loss in weight of the object, or analyzing the stripping solution for the metal dissolved. For measuring local thickness, the microscopic, magnetic and jet methods were described. A check was made on the spot test for chromium thickness in which a drop of concentrated hydrochloric acid is placed on the surface and the time for the deposit to dissolve taken. Each record is equivalent to one one-millionth of an inch of chromium. This test gives satisfactory comparable results only if the temperature is constant. (80 deg. F. approximately). A study is being made of porosity tests. The salt spray is not consistent. The ferroxyl test is not entirely satisfactory. Some new methods are being investigated in an endeavor to fill the need for good porosity measurements.

Color Photography for Inspection

The use of "*Color Photography in the Inspection of Exposure Tests of Plating*" by C. E. VINCENT DAVIES and DR. WM. BLUM described the use of photography to preserve in the form of a permanent record the appearance of the test pieces at various stages. Slides were shown which demonstrated the value of this procedure.

Magnetic Method of Measuring Thickness

A magnetic method for measuring the thickness of nickel coatings on nonferrous metals by A. BRENNER of the Bureau of Standards, described this method in which a small magnet suspended on a torsion spring is placed on the surface of the object. The force necessary to pull the magnet free is measured by the amount of twist applied to the spring and from this the thickness of the nickel is obtained. The heavier the deposit the greater the pull on the magnet. The application of this test is very rapid and MR. BRENNER gave a demonstration. Due to the simplicity and accuracy of the

JOSEPH P. SEXTON
2nd Prize for individual exhibit

method it promises to be a valuable control in the production of plated articles to meet specifications.

Evaluating Plated Coatings

"*Experiences in Evaluating Plate Coatings*" by W. S. PINNER and L. B. SPERRY of the Detroit Branch. This paper constituted a report on the results obtained under industrial conditions of methods for testing plated coatings. In the ferroxyl test, using the treated paper, it was found that the results are influenced by the length of time which elapses from the time the paper is wetted to the time it is applied to the surface under test. The importance of maintaining constant temperature in the salt spray test was shown by the fact that a specimen which stood up 150 hours at 70° F, broke down in 5 hours at 200° F, and lasted an indefinite time at 50° F. The position of the piece in the salt spray should be such that all condensed spray runs off and does not lay on the specimen otherwise a "salt pool" test will be the result. The need for the production and specification of a standard salt mist in the spray chamber was brought out.

Barrel Electroplating

The next session was presided over by W. S. BARROWS, third president of the A.E.S. JOSEPH UNDERWOOD of Philadelphia Branch, presented a discussion of *Barrel Electroplating*. For barrel nickel the suggested formula was single salts 16 ozs. boric acid 3 ozs. ammonium chloride 3 ozs. per gal. of water. Ammonium rather than sodium chloride was preferred as the latter may be the cause of brown stains on the work. In brass barrel solutions the control of temperature is important. As the solution is worked the temperature rises and a red color results. An iron coil should be placed in the solution with connections for steam and cooling water. Rochelle salts are beneficial. Metal ratio 4 copper to 1 zinc, free cyanide not over 2 ozs./gal. Some platers use arsenic as a brightener others prefer burnishing with leather chips. Caustic soda increases throwing power but excess may be harmful. Excess can be removed by treating the solution with coke. Arsenic plating is done with a solution of arsenious acid 10, caustic soda 10, copper cyanide 1, sodium cyanide 1 oz. per gal. Room temperature, brass anodes.

JOHN H. FEELEY
3rd Prize for individual exhibit

Electroplating Abroad

WALTER R. MEYER, General Electric Company, spoke on *Electroplating in Europe* and the First International Electrodeposition conference. The conference was attended largely by technical men and was therefore thought not as fortunate as meetings in the U. S. where the practical man constitutes an important part of the attendance.

Several industrial plants were visited and it was noted that many women are employed in plating rooms. In one factory 85% of the plating employees were women. The hourly rates of pay were about 25-48c. There is a tendency towards increasing the working hours. Regarding cleaning methods, the vapor degreaser is widely used although these are mostly of the single phase vapor type. Cyanide copper cleaners are also common, using a formula copper cyanide 10, sodium cyanide 25, caustic soda 40 grams per liter. Bright nickel plating solutions are being used to some extent. In ordinary nickel solutions air agitation is a general thing although not much over 10-12 amperes per sq. ft. current density is used.

In Germany there is a shortage of nickel and much use is being made of aluminum for metal parts. A process has been developed for producing photographs of fine detail on aluminum sheet. Many objects are also being made of plastics and for metallic effects these are electroplated.

Bright nickel is used to some extent but bright cadmium is not so common.

Free Cyanide in Silver Solutions

The next paper was by Messrs. HIRSCH, JACKSON, SNYDER and VENELLE of Philadelphia Branch and was "*The Effect of Free Cyanide on the Cathode Efficiency of Silver Plating Solutions*". The solution used was originally made up with 30 gms/1 of silver cyanide plus just enough sodium cyanide to dissolve it. The sodium cyanide was added in increments of 5 gms/liter. Measurements of cathode efficiency and resistivity were made after each addition. A similar set of measurements was made but with increasing amounts of sodium carbonate. It was found that the cathode efficiency remained unchanged as the carbonate increased from 0 to 125 grams/liter.

Spotting Out

GUSTAVE KLINKENSTEIN of MAAS & WALDSTEIN spoke on "*The Prevention of Spotting Out*". The two types of spotting "Crystal" and "Stain" were discussed. Crystal spotting occurs only on oxidized finishes which have been lacquered. The cause is usually sulphur or hydrogen sulphide which attacks the work after finishing. The sulphur may come from the atmosphere, the paper, or rubber bands in the packing materials, or coal gases. The lacquer holds the particles in place. Stain spotting is more serious and is due to residual salts left in the pores of the metal. Cyanides are the worst offenders. The free cyanide in the solutions should be kept at a minimum and attention should be given to improvement of the castings so as to reduce porosity. After plating, alternate hot and cold water rinses will assist in removing entrapped salts. Or, the work may be allowed to stand in a warm moist place for some time which will cause any spotting to appear. The pieces can then be scratch brushed or buffed which will remove the stains and then immediately lacquered. Another remedy consists in baking the work at 250° F. after plating then lacquering. Water dip lacquer can be used and in any case a non-spotting type of lacquer should be specified. The recommended procedure for cold rolled steel is to nickel plate before applying a cyanide solution finish. On malleable castings the recommended procedure is clean, brass plate, allow to stand overnight, bright dip, barrel roll, bake, lacquer.

Health Hazards

JOHN E. STERLING, past president of the A.E.S., presided at the next educational session. A paper entitled "*Health Hazards in the Plating Room*" was presented by MR. CARLSON of the Cleveland Branch. This important subject is closely linked with increased efficiency, lower production costs and lower insurance rates. Silicosis was discussed as one of the major problems. The dust arising from buffing operations and especially those using silica compounds is harmful. Some individuals having a certain physical make-up are susceptible to nickel itch. Ointments, or treatments as for poison ivy, under a physician's direction can be used but if these are unsuccessful the individual must look to changing his diet or other correction to the physical condition.

Chromic acid sores can be healed by drying them out and applying sodium bisulfite. The use of dry boric acid was also mentioned. For protection of the nasal septum vaseline should be applied in the nose. Lanolin or wool grease will help protect the arms and hands. Lead poisoning can come from lead burning, lead pot heat treating, painting or lead plating, which latter is the worst operation because the lead is dissolved. The hazard from cyanide sores can be reduced by giving each employee his own rubber gloves, boots and apron. A cyanide sore can be treated by removing the scab and swabbing with a 10% solution of carbolic acid. Then wash with alcohol.

Barrel Nickel Plating

"*The Cathode Efficiency of Electroplating Barrels and Its Effect on the Adhesion of Nickel Deposits*" was presented by ALBERT HIRSCH of CAREY-MCFALL CO. In the plating of cold rolled steel parts it was found that there was a minimum current density below which the deposit would not adhere. The solution used was composed of single nickel salts 36, nickel chloride 3.3 and boric acid 4 ozs. per gal. The pH was 6.5 and the temperature 120° F. The adhesion was evaluated by noting if the articles withstood a ball burnishing operation without peeling. Several types of barrels were experimented with to determine if improved results could be obtained. A 14" x 30" double live end barrel with 4 dangler contacts gave a current density of 1 ampere/sq. ft. and non-adherent deposits resulted. A 12" x 30" barrel with 36 points of contact gave a C.D. of 2.16 amps/sq. ft. The plated work from this did not peel. In an effort to increase the current density a lead lined tank was changed to rubber lining, but no improvement was had.

Silver Plating

FRANK C. MESLE, of Oneida. Ltd. gave a paper entitled "*A Resume of Silver Plating*". Grease buffing on a rag wheel with tripoli is still the approved method of polishing nickel silver tableware. The tripoli is removed in a soap solution, then in an alkali followed by a cyanide dip. Etching in an acid is not necessary as a good

bond can be had if the metal is perfectly clean. The concentration of silver and cyanide can be varied to suit the work. For very light deposits a low concentration such as silver 1 oz. and free cyanide 2 ozs. per gal is recommended. With higher concentrations more metal will be removed in the dragout than is deposited on the work. For quality plating a solution of silver 3-4 ozs. potassium cyanide 4-6 ozs. and carbonate 4-12 ozs. is used. Potassium salts are recommended as they permit higher current densities and produce more easily finished deposits.

Some very interesting data was then given on the relation between current density and solution temperature. Production can be increased 50% by raising the temperature from 70 to 90 deg. F. Temperature of solution, composition and agitation all influence plating results and under certain conditions a current density of 200 amperes/sq. ft. has been used although this is not commercial as yet. A set of samples in which the type of deposits obtained at various temperatures and current densities was shown. In order to get the desirable bright plate it was necessary to increase the current density in the higher temperature solutions.

MR. MESLE then described an improved form of his chord method in which he uses a file bent to a 10″ radius instead of the original grinding wheel of 4″ radius. The 10″ radius permits the measurement of coatings of .0002″ or thinner. The file is held in a jig and after cutting through the deposit the width of the cut is measured on a special scale from which the thickness can be read directly.

Practical Pointers

"*Simple Ideas That Worked*" by W. S. BARROWS of Toronto Branch gave many practical pointers for the plating room. In some plants the heating coils from several tanks are connected to one trap. This results in a longer time being required to heat up in the morning as the lines are full of water. A better practice is to put a trap on each heating coil. An experience with a lead coil was described in which the coil burst and caused the solution to be accidentally syphoned out. To guard against this a ball trap was explained that can be made up and installed on the coil so that no syphoning action will occur. Several good pointers were made on the care of generators and especially the commutator.

The use of caustic soda was recommended to revive old cleaners. Other suggestions included a special shape of anode to give improved corrosion properties and an arrangement of the water line to a rinse tank so as to completely replace the volume of the water and also provide for removal of scum that collects on the surface.

Gold Plating

At the following session HORACE SMITH, Newark Branch, and past president of the A.E.S., presided. "*Gold Electroplating*" was presented by Paul OLDHAM for Newark Branch. Gold is applied to a large variety of products either for its appearance or its resistance to corrosion. A gold plating solution consists of gold, cyanide and other ingredients added for special purposes. Gold metal can be dissolved in aqua regia. (3 parts hydrochloric to 1 part nitric acid). To dissolve 1 oz. of gold use 8 to 10 ozs. of aqua regia. Add resulting solution to 2 gals. of water then treat with ammonia until solution is alkaline to litmus. This precipitates gold fulminate from which the plating solution is made. Jewelers use potassium salts in making up the solution since finer-grained deposits and higher current densities can be obtained. Large scale manufacturers, however, use sodium salts.

The gold content can be from 1 to 10 dwt./gal. 3 to 5 dwt. being suitable for most work. Phosphates can be from 2-8 ozs./gal. Potassium ferrocyanide is added to get darker deposits. Other salts used are potassium nitrate, sodium bisulphite, sodium thiosulphate. Anodes can be stainless steel, nichrome, or carbon. A temperature of 140 deg. F., current density of 1-12 amperes per sq. ft. and voltages of ½ to 15 volts cover the range of conditions for operation on most work. Containers can be of enameled ware, crocks, or pyrex ware.

Barrel Rolling

"*The Barrel Rolling of Metal Parts*" was presented by WILLIAM GRAY, WATERBURY BUTTON CO. for Waterbury Branch. Four types of barrel rolling were enumerated. 1. Sand or abrasive rolling. 2. Ball burnishing. 3. Bright or Dry rolling and 4. Color finishing. For small cold rolled steel parts a 2 compartment 10″ x 47″ hexagonal barrel was used. One pound of fine silica is added to a 150 lb. load and water introduced to a depth of 1″ over the work. The barrel is rotated at a speed of 24-34 rpm for 48 hours. The abrasive is then thoroughly rinsed out. Then add ¼ lb. red oxide of iron polirot, 1 lb. of fine sawdust and roll 48 hours. Rinse. Then roll 20-24 hours with 6 ozs. cream of tartar and 6 ozs. of soap bark. Rinse in neutral soap (1 oz.) plus slaked lime (2 oz.) to prevent rusting.

For work with large flat surfaces use steel cones (2 parts by volume to 1 part by volume of work). Case hardened work does not require the cream of tartar roll. Brass parts are rolled with ¾ lb. of rottenstone plus water, then bright or matt dipped. For rolling brass bright, the metal is bright dipped first, then rolled with some alkaline cleaner. The final roll is done with soap bark and cream of tartar. For a bronze color finish on steel the work is placed in an open end barrel, rolled with cleaner, rinsed, rolled with sulphuric acid, rinsed, and then rolled with a solution of copper sulphate 2, sodium thiosulfate 1 oz. per gal. This solution is discarded after use. To relieve the highlights roll in soap solution plus some pumice.

For a blue black color use the following solution: ammonia 1 qt., copper carbonate 1 lb., water 3 qts. Use at 175° F. 3-4 minutes. Save the solution. For an oxidize finish use 1-2 ozs. of ammonium sulfide.

Silver Plating

DONALD WOOD of REED & BARTON gave a paper on "*Something New in Silver Plating.*" A new type of silver solution with the following formula was suggested: silver nitrate 4, sodium cyanide 4, potassium nitrate 16 oz./gal. Removal of carbonates by calcium nitrate is described. The advantages of the potassium salt solutions are claimed at a cost lower than that of the usual sodium solution. A study of carbon disulphide brightener was reported and a hypothesis on its mechanism was presented. Experimental work and plant experience is described in support of the claim that the character of deposit from this solution especially with carbon disulphide brightener, is superior to that obtained from either the sodium or potassium carbonate solution.

Chlorinated Rubber in Lacquer

The next paper was by LEON ROON, Technical Director, ROXALIN FLEXIBLE LACQUER CO. An account was given of the use of chlorinated rubber in lacquer. This material was developed in Germany. It is a white powder, soluble in organic solvents. Through research it has been developed to give a flexible and adherent lacquer film with a salt spray resistance of at least 400 hours and as high as 5,000 hours. It is resistant to both acids and alkalis, will dry in 15 minutes although it takes a little longer than regular lacquer to reach full hardness.

Air Conditioning

EDWARD C. DELORME of Boston Branch presented "*Air Conditioning of the Plating Plant.*" The material of construction presents a difficult problem. Fumes are removed by hoods on the tanks. The minimum velocity to use must be determined for the efficient removal of vapors. Ceramic or wood are not suitable for exhausts. Asphalt coatings or alloys are possible for acid fumes but the best thing is to localize all fumes of one kind such as hydrochloric, nitric or sulphuric acid, thus simplifying the problem of material of construction. Most designs call for recirculation of 75% of the air. Conclusion is that each problem must be analyzed separately.

Gypsum for Removing Carbonates

A paper by R. O. HULL, of the GRASSELLI CHEMICAL CO. was presented on "*Removal of Carbonates from Cyanide Solutions by Means of Gypsum.*" Carbonates have a deleterious effect on the brightness of cadmium deposits. Precipitation with barium cyanide, or barium chloride or freezing out, have been used. The last is best but is applicable only in cold weather. With the use of gypsum (calcium sulphate) the carbonate is precipitated as calcium carbonate. Gypsum is 40 times more soluble than calcium carbonate. The sodium sulfate which is formed is not harmful. Tests have shown that satisfactory results can be obtained with this method on cadmium, silver, zinc and copper solutions. One ounce of sodium carbonate is precipitated by 1.6 ozs. of gypsum.

Brass Plating

At the next session OSCAR SERVIS, past president of A.E.S. presided.

WALTER MEYER presented "*Brass Plating*" as produced by members of Bridgeport Branch. The formula used was in general similar to the one appearing in book by Blum & Hogaboom. The copper content can be varied from 3.5 to 5 ozs./gal. without effecting the color provided the metal ratio is maintained. The ratio should be 4 of copper to 1 of zinc. Current density 2.5 amps./sq. ft. Plated brass has a higher copper content than cast brass of the same color. The zinc content of the solution should not be too high as this causes excessive anode polarization. A brass deposit containing over 40 or less than 20% zinc may be pink in color. The free cyanide may be from 1.5 to 2.5 ozs./gal. the carbonate content 4-10 ozs./gal. Ammonia is added in making a new solution and is probably beneficial because it acts as a buffer and also prevents the precipitation of basic salts. Caustic soda will increase the zinc content. Arsenic in the amount of ¼ oz. of arsenic trioxide dissolved in caustic soda to 100 gallons of solution is used as a brightener. Phenol, nickel and lead are other brightening agents. Blistering is due to too high a current which causes the formation of basic salts. The optimum pH range was 9.8 to 12.5 for C.P. salts and 9.8 to 10.8 for commercial salts. The effect of impurities in the solution was emphasized and the need for more attention to this factor was brought out.

The pH of Alkaline Plating Solutions

The next paper was by GEORGE B. HOGABOOM of the HANSON-VAN WINKLE MUNNING CO. on "*The pH of Alkaline Plating Solutions.*" A study was made upon the pH changes in standard plating solutions on the anode and cathode efficiencies. The solutions run were brass, cyanide copper, cyanide copper and rochelle salt, cadmium, zinc and silver.

It was found that both anode and cathode efficiency were materially effected by changing the pH value of the solution.

It was found that the copper-zinc ratio of the deposits from a brass solution ranged from 98% copper and 2% zinc to 45% copper and 55% zinc when the pH of the solution was 8.2 and 13.4 respectively. The pH range of silver solution is very wide while that of zinc is very narrow.

Micrographs of the effect of the pH on the structure of deposits cyanide copper, and cyanide copper-rochelle salt solutions were shown.

Cyanide Copper Plating

FRANK J. KOHLMEIER of BAUSCH & LOMB OPTICAL CO. *gave a paper* "*101 Questions on Cyanide Copper Plating,*" contributed by Rochester Branch. Five different cyanide solutions of widely varying composition were used in plating steel plates, 4" x 4". The time of deposition was the same in all cases. Slides were shown of the appearance of the plates after exposure to salt spray. It was found that the plates which broke down first has the thinnest deposit as measured by the microscope. Tests were also made of the porosity by means of the ferroxyl method.

As a result of this work several questions presented themselves. Some of these are: Is there one cyanide copper solution suitable for all classes of work? If not, what solution for each class of work? Does brightness affect the density of copper plate? What is the effect of temperature on the deposit and what is the best operating temperature? What is effect of current density and agitation? What is best type of anode? Method of preparing grey iron or steel? White metal, combination of metals? Questions were also asked on the cause of blistering and the effect of sodium carbonate.

Rhodium Plating

"*The Manufacture of Rhodium Plating Solutions*" was presented by LIONEL CINAMON of SPECIAL CHEMICALS CORP. Rhodium is obtained from the Ural Mountains in Russia, Colombia, South Africa, and from the Canadian refinery residues. Platinum ores contain up to ½% of rhodium. Due to the chemical inertness the metal is brought into solution with difficulty. One method consists in heating a mixture of finely divided rhodium and salt in a tube through which chlorine gas is passed.

The method which was given in the paper consisted in melting together 2 ozs. of rhodium plus 10 ozs. of C.P. lead using sodium bicarbonate flux. The melt is poured into an iron mold and the resulting button, after clean-

ing, is treated with nitric acid which dissolves out the lead. The finely divided rhodium is brought into solution with sulphuric acid and then precipitated with ammonia. The pure rhodium hydroxide precipitate is used for making up either the sulfate or phosphate type of solution. The best underplate for rhodium is nickel. The metal cannot be deposited on lead, zinc cadmium or high zinc brass. Some methods were given for stripping rhodium deposits.

Papers of A. E. S. and International Conference on Electrodeposition

Transactions of the International Conference held in March in England (see METAL INDUSTRY, May, 1937, p. 212-220) will be available to platers in this country. There are 28 papers with their discussions, printed in bound volume. Anyone ordering them through W. J. R. KENNEDY, 90 Maynard St., Springfield, Mass. can have them at the same price as the members of the Electrodepositors' Technical Society pay — about $3.00 per copy.

Transactions of the A.E.S. giving, in full, all of the papers and discussions abstracted above, can be obtained from Mr. Kennedy. Price $5.00.

Exhibits of Members' Work Equipment and Supplies

A comprehensive exhibit of plated and finished work by members of the A. E. S. was displayed at the Hotel Pennsylvania and at the Metals and Plastics Bureau, Rockefeller Center. Lack of space in this issue makes it impossible for us to describe this display here, but a full list and summary of the individual exhibits will be published in our August issue.—Ed.

Casting Bronze Tablets

Q.—Your 1936-37 Casting Manual has just reached us and, after carefully reviewing its contents, and, noting that you are ready and willing to grant additional information to the foundry trade, we feel constrained to ask your advice with reference to the most up to date methods for the casting and finishing of bronze tablets, which are commonly used for memorial and dedicatorial occasions.

A.—This class of work is generally made of an alloy containing:

86.6 copper
6.8 tin
3.3 lead
3.3 zinc

Such bronze must be made from all new metal — electrolytic copper, Straits tin, high purity zinc, and domestic refined lead. This mixture will be fluid when melted, file easily, and it is said will take on green patina upon exposure to weather. This mixture does not cause spelter smoke to produce bad spots.

It melts at sufficiently low temperature to prevent the casting from chilling before it runs up full, and will not cause the sand to burn in. A facing sand should be composed of 3 parts French sand, 2 parts Windsor Lock sand, ⅛ part flour, and temper with molasses water. This will produce good castings. Skin dry molds.

As to the finishing: after the casting is cleaned and given as high a polish as possible with wire wheel brush, then flat-face the letters and the border and go over the letters for any imperfections that may occur in molding. See that each letter is clean cut. Brighten with sandpaper disc.

The finished plate is dipped in a solution of barium sulphide after spraying with clear lacquer. For the best work give the tablet two coats of clear lacquer, the first one a little heavy and the second one light. This will hold the finish and is necessary for outside work.

The solution gives the background an old bronze color and the polished parts a lighter shade, so that the letters and the border stand out. Barium sulphide solution should be about ½ oz. to 1 gal. of water; use warm water.—W. J. REARDON.

We Make Amends

From all directions we have received congratulations on the appearance and content of our last issue. A large part of this praise was due to the History of the American Electro-Platers' Society written by George B. Hogaboom

FRANK C. MESLE
President, A. E. S., 1926

and illustrated by photographs of the past presidents. But for us, the praise is misplaced. A blunder of first magnitude was made in this article and the fault was entirely our own. The photograph of FRANK C. MESLE, president of the American Electro-Platers' Society in 1926, was omitted.

For that blunder we herewith publicly apologize.

FRANK C. MESLE has been a pillar of the American Electro-Platers' Society since its earliest days. He was Editor of the A. E. S. Review for several years. He has been active in the work of his Branch and a regular and valued contributor to the educational sessions of the Society since he became a member in 1914. Mr. Mesle, who entered the employ of the Oneida Community Ltd., as a boy, worked his way up from the bottom to the post of foreman plater and has also devoted considerable time to the new development and research division of his company. He is responsible for the use in his plant, of the ampere hour meter for controlling silver deposits. He is also responsible for a recent outstanding contribution to the industry—the "Chord" method of measuring the thickness of deposits.

Mr. Mesle is the highest type of "practical plater"; representative of the Society at its best. Starting from the bottom, with no advantages except the one with which he was born—character—he stands out as a Worker, a Scholar and a Gentleman.

The Manufacture of Silver Flatware and Hollow Ware

How one of the oldest firms of silversmiths in the country produces high quality goods by modern methods

By **CHARLES A. RIVARD**

Superintendent, Reed & Barton, Taunton, Mass.
***As told to* FRANCIS A. WESTBROOK**

THE silverware manufacturing business of Reed & Barton was started in Taunton, Massachusetts, in 1824 and has grown from the small beginning of a fourteen foot loft to a modern plant covering fourteen acres. As is well known, the production consists of flatware and hollow ware of the very fine quality in both sterling silver and silver plate which has been retained throughout its existence. Of course, in manufacturing for this kind of trade, handicraft enters into a very large extent, and there is much manual labor involved. As many of the steps of fabrication have been mechanized as is practicable, and the whole plant has been laid out according to the most modern ideas of economical production, with special reference to reducing internal transportation to a minimum and yet maintaining the uniform excellence of the work. The well carried out combination of machine and hand operations can best be explained by considering how a particular piece is made.

Fig. 1. Entrance, Reed and Barton silverware plant, Taunton, Mass. with W. E. Watson, purchasing agent in the doorway.

Although flatware forms an important part of the company's business and will be touched upon later, the company has always been noted for their hollow ware and the steps in the production of many of such items involve many manual operations and much machinery. For this reason, it will be more interesting to discuss the hollow ware first.

Preparatory Work

Hollow ware is made in both silver plate and sterling. Plate involves more operations than Sterling so the coffee pot of the No. 6000 "Renaissance" set has been selected to follow through. Actually the set consists of a whole service of similar design which is very elaborate.

The Assembly Material List is shown below.

From this it will be seen that the parts required for the fabrication of the coffee pot are four 10% nickel silver discs, twenty-seven white metal molded parts, two insulating parts for the handle, a white metal cut ring for the cover seat, and a white metal bezel for the cover. In addition to this a joint mold is called for. The materials for an order are assembled and prepared for the manufacturing operations in the Preparatory Department. That is, the circular blanks of base metal, in this case 10% nickel silver, are cut to the proper sizes on power shears. For designs which call for cut borders these are made on the machines provided for this purpose. If the cuts are deep, it may be neces-

Assembly Material List

Article—Coffee Style No. 6000

1	10% Circle for body 10¾″ x Ga. .036
1	10% Circle for neck 6¼″ x Ga. .036
1	10% Circle for cover 5″ x Ga. .036
1	10% Circle for base 5½″ x Ga. .036
1	Insulator for top of handle No. 1220
1	Insulator for bottom of handle No. 41230
1	Joint Mould 4942-4948

White Metal

1	W. M. Cut ring 3¾ x 3 x 5 Ga.
1	W. M. Cover bezel 4¼ x Ga. 14

White Metal Castings

1	W. M. Foot Mount Mould WP327
1	W. M. Handle Mould WP323
1	W. M. Spout Mould WP322
1	W. M. Tip Mould WP336
1	W. M. Cover Mount Mould WP333
2	W. M. Neck Mounts Mould WP328
4	W. M. Side Mounts Mould WP330
4	W. M. Top Center Mts Mould WP331
4	W. M. Lower Center Mts Mould WP335
4	W. M. Ends for Side Mounts Mould WP334
4	W. M. Drop Ornaments WP332

Fig. 2. Four single acting pneumatic drop hammers used for stamping flatware at Reed and Barton plant, Taunton, Mass.

sary to anneal between cuts. A base metal of 10% nickel silver is suitable for this type of home service; but for other services, such as hotels, 18% nickel silver is used because of its extra strength which fits them for the harder conditions.

White metal molded parts are used because they are satisfactory for home use, and more easily worked where the designs are very elaborate, as in the one under consideration. The casting is done in molds made of bronze. The castings are trimmed and scraped by hand.

Spinning Operations

The bodies, covers, necks and bases of the coffee pot are spun in a separate department on bench lathes. After a certain amount of spinning, annealing becomes necessary because

Fig. 3. Pneumatic drop hammer of 600 lb. capacity at Reed and Barton plant. This hammer is double acting, i.e., there are air cylinders both top and bottom.

of the hardening effect which takes place. The body is put through seven spinning operations with six annealings between, and on account of the shape which it is finally given, the last two spinning operations are done on a sectional chuck. The covers, being of comparatively simple design, are spun and annealed only two times, and the neck and base three times. Nothing in the nature of assembly begins until the 13th operation. It is at this point that the various parts are brought together and the "making" (assembling) starts.

Assembling

The various steps in assembling are clearly defined on a Master Route

Fig. 4. Shaping a piece of hollow ware by spinning at the Reed and Barton plant, Taunton, Mass.

Sheet in their proper sequence, covering 45 operations before the coffee pot is complete. The necks are soldered in place by use of a gas blow torch. The body, cover, and base are then polished and put in place. This is done before any of the mounts are fitted so as not to interfere with these processes. The decorative mounts of cast white metal are then fitted and soldered to the body, etc.

Numerous dressing-off operations follow, and this is done in many cases by grails for the roughing, followed by finishing by hand filing. In other cases hand cutters are used. Where large service pieces are involved, the dressing off may be more easily and quickly accomplished with a band saw. A sand disc is used for truing edges and giving a good finish where parts are joined together.

Spout holes are drilled in the body of the coffee pot with the aid of a template and when grinding handles to fit the body, they are held in a jig. Each handle and spout is individually fitted to a particular body.

Preparation for Plating

The final polishing operations before plating consist of the greasing finish, followed by washing in hot water and soap powder, and rinsing. The next step is a careful inspection to make sure that there are no imperfections, after which comes the grease buff with a cloth wheel and tripoli compound. This polishing department is large, having something like 150 polishing and buffing spindles installed. A considerable portion are of a new type with individual motor drive, used for operations of an intermittent character where it would be wasteful of power to have group drive. On the other hand, the volume of work going through this department is so large that it would not be economical to have individual motors for all the spindles.

Finishing

After plating, the coffee pot which we are following through is treated with an oxidizer to accentuate the design. This is then buffed to bring out

Fig. 5. Pull hammer shaping and impressing a pattern on hollow ware at Reed and Barton plant, Taunton, Mass.

high lights, after which it receives a series of washings and cleanings in the following sequences: (1) hot soapy water, (2) cold water rinse, (3) steaming around the handle if necessary, (4) hot water rinse and (5) hand wiping. Color buffing comes next with a final washing.

Hotel Hollow Ware

This is typical of the fabrication of all the more or less elaborately

Fig. 6. Chaser decorating piece of hollow ware at Reed and Barton plant.

decorated hollow ware. Sterling silver is handled in just about the same way as plated products. In the case of hollow plated ware for hotel and public dining services where the usage is severe, 18% nickel silver base metal is used and the mounts are made of the same material. The parts are joined with silver solder and large torches are employed which will give the required amount of heat quickly. The parts to be soldered are set on bench turntables filled with coke for the performance of this operation.

Some of the comparatively shallow hollow ware, of course, is stamped. The blanks are cut on the power shears and then are stamped with dies under the hammers. The depth of the piece determines how many times it must be struck and the number of times it must be annealed. Trimming is usually done on the power shears, although there is a hand operated shear for very delicate work. Mounts are applied in just the same manner as on the coffee pot discussed above, and the preparation for plating is the same. The details of attaching the parts, such as spouts, handles, and the like do not enter in here, but the bottom of large pieces, such as trays, must be hammered flat by hand.

A number of annealing furnaces are in use, electrically heated with a hydrogen atmosphere to prevent oxidation of the metal.

Grading for Flat Ware

The production of flat ware is more simple on the whole and is therefore, more highly mechanized than the hollow ware. However, a great deal of skill is required for both types of goods. Some very up-to-date machinery has been installed in the Reed & Barton plant so that a brief description will be of interest.

Blanking is, of course, the first operation, whether Sterling silver or nickel silver is to be used. With both spoons and forks, the blanks are cross-rolled in order to give them the requisite width, after which they are annealed to soften them for the next (grading) process. This consists of varying the thickness of different parts of the blank so that the finished product will have extra metal at points where strength is required, or where the design which is later stamped with the dies calls for additional metal.

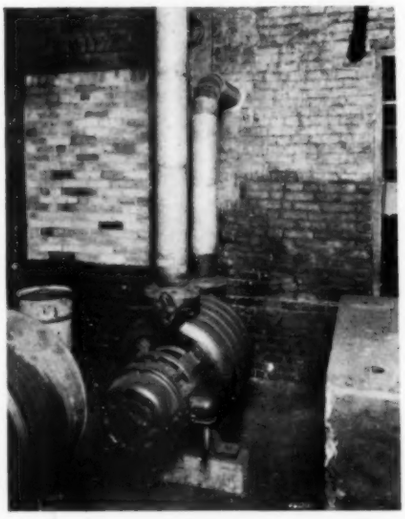


Fig. 7. Type M motorblower in Reed and Barton plant. Unit delivers 600 cfm at 1 1/3 lb. discharge pressure. It is driven at 3500 RPM by a 10 HP GE induction motor.

Thus, with spoons the portion of the blank which will form the bowl is thinned, and parts of the handle are left thick where this is mechanically desirable. And the metal can be left thicker in certain spots where the decorative design is to be die-stamped. The very accurate grading which is now possible with properly shaped rolls greatly facilitates all this work. Another advantage of the right kind of grading is that there is less flash resulting from the stamping operation, because the blank has been better prepared for it.

Stamping Operations

Stamping operations are carried on in the Reed & Barton plant by means of drop hammers to a very considerable extent but there are now a number of pneumatic hammers in service which give very excellent results. The newest units of this type of hammer have the anvil move up and meet the hammer as it comes down. This, of course, gives the effect of a much harder blow with a much lighter hammer; there is no wasted energy to be absorbed by the foundation with the resulting vibrations and jars, and, due to the use of compressed air for power, the overhead shafting with its well-known disadvantages, is eliminated. Also, the absence of dirt from shafting and belts is very helpful in keeping the dies free from foreign matter which might spoil work.

Air Compressors

While on the subject of pneumatic hammers, which is probably one of the most important of the recent advances in the stamping of metal, it is worth giving a moment of attention to the air compressing equipment. Two 107 c.f.m. machines, driven by a 15 hp. motor through Texropes, supply air at 105 lbs. to a receiver which serves four hammers. Another larger hammer is individually supplied by a 31 c.f.m. compressor driven by a 7½ hp. motor. In addition to the air required for the hammers, a large supply of low pressure air is needed for the oil-fired furnaces used for annealing and the soldering of knife handles. This is supplied at 1½ lbs. by a "motorblower" with a rating of 600 c.f.m. and driven by a 10 hp. motor.

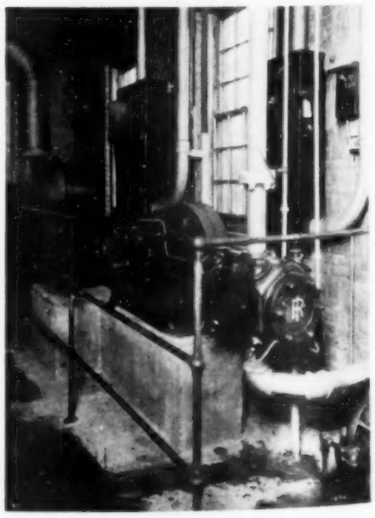


Fig. 8. Class ES-1, 7 x 7 compressor, Reed and Barton plant.

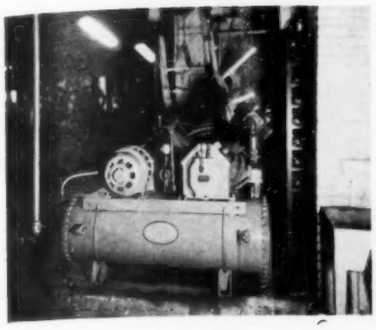


Fig. 9. Type 30 compressor 6 x 3½ x 4, at Reed and Barton plant. This unit the ES-1 and a 7 x 7 ER-1 furnish air for drop forging hammers used in stamping flatware.

Annealing, Washing, etc.

The stamping processes, of course, harden the metal so that it is necessary to anneal the parts at various stages in the forming, similarly to the requirements in this respect when spinning hollow ware. This naturally will vary for different designs, the amount of annealing called for, depending on the extent to which the metal is made to flow cold. For certain very elaborate designs in silver the pieces are hot-forged, but this is exceptional. In addition to annealing, the pieces are frequently washed in hot soapy water between successive steps in production so as to remove grease, dirt and grit which would leave their mark in the stamping operations and spoil the finished product, or at least make a great deal of extra polishing necessary.

The flash is trimmed, usually in presses, and the edges ground smooth on sanding wheels after the design is impressed by die stamping. This is followed by polishing on walrus hide wheels and brushes with pumice and oil, and then comes the final washing which is similar to that described for the hollow ware. This finishes the Sterling silver ware, but the plated ware next goes to the Plating Department and final finishing, all of which operations are similar to those already discussed.

Fig. 10. Sterling silver "Plain Antique"; Reed and Barton manufacture.

Knife Handles

The making of the knife handles involves several operations peculiar to them and which are of considerable interest. They are made with stainless steel bladeswhich are purchased outside, ready for assembling. The handles are made of Sterling silver or are plated, and they are left hollow partly to reduce weight and partly for structural reasons. As a matter of fact, the handles are made in two separate and similar halves by stamping operations from blanks, very much the same as the other items of flatware just described. It is in the joining together of the two halves that the present interest lies because of the ingenious methods employed.

As a first step in assembling the handles, the halves are temporarily held together by two spot welds on each side. They are held in a jig for this purpose and the operation is very fast. Permanent joining is accomplished by means of powdered silver solder which is introduced into the open end of the hollow handle and distributed around the edges by manual shaking of the piece. Some dexterity is needed for this but the men who do the work have become very expert so that it is a perfectly practical method. The handles are then placed in an electric furnace which is hot enough to melt the solder which, in the molten state, flows around the edges due to capillary action and securely attaches the two halves to each other. After soldering, the excess material which may have worked through the seam is removed by grinding.

The tang of the knife is next inserted into the handle and is electrically joined to it, by means of a resistance welder.

Equipment Required

The principal items of equipment used are the following:

Fig. 11. Sterling silver tea service "Georgian Hand Chased."

Power Shears
Machines for rolling mounts
Lathes used for spinning
Band saw used for dressing off
Sand disc machines
Polishing and buffing spindles
  Group driven
  Individually motorized
Motors
Soldering torches
Annealing furnaces: electric; oil fired
Drop hammers: belt driven; pneumatic
Air Compressors
"Motorblower"
Blanking machines
Rolls for blanks
Eccentric grading rolls
Spot welders
Electrical soldering machine for soldering knife handles to blades.

An Electroplating Department for a Small Manufacturer

A practical description by a practical man, of "what it takes" to install a plating plant that will work.

By **ROBERT J. GREEN**

Member of the American Electro-Platers Society, Detroit Branch.

THIS paper is a description of the practical aspects of setting up a simple plating department, covering cleaning, copper, bright nickel, regular nickel and chromium plating.

The Floor Plan

The first step is to lay out the floor plan on paper. Make a drawing of the space to be used. If possible, place the department on the lower floor of the plant. The tanks should be placed in such a manner that the various operations will not interfere with each other. Place the plating tanks along a wall near the windows in such a way that the bus bars from the generator will run in as straight a line as possible.

In making the working drawing, the tanks may be represented by cutting small rectangles of paper and pinning them to the drawing, showing just where each tank will go.

Two motor-generator sets will be necessary — one for the copper and nickel, and one for the chromium tank. The generator for copper and nickel should have a capacity of 4000 amperes at 6 volts. A control panel is necessary.

The floor should be covered with a minimum thickness of one inch of asphalt or similar composition, laid over the original flooring for protection, with a one inch slope from the outer edge to the center of the plating room to a drain.

The Nickel Tank and Accessories

The nickel tank may be of steel, lined with 6% antimonial lead; 10½′ x 4′ x 4′, to contain 1000 gallons of solution.

The distance from the top of the tank to the floor is about 55″ to 57″. Platforms around the tanks should be 2′ off the floor, leaving a lift of a little less than 3′. The flooring should be constructed of 1½″ planking using 2 x 4's for the uprights. As the passageways between tanks are about 3′ wide, the platforms will be 6′ x 3′ x 2′.

The accessory electrical equipment consists of one 1500 ampere rheostat with ammeter and voltmeter attached; a 1500 ampere shunt; three anode bars and two cathode bars; 1¼″ in diameter.

The cathode bars should be connected to an agitator which will move them back and forth from 6″ to 8″. They should ride on rollers, one at each end of the tank. The anode bars should be stationary and securely fastened to porcelain insulators on each end of the tank.

Such a unit will be a fairly heavy job and the weight should be distributed as evenly as possible. For tank foundations, use pieces of timber, preferably 4″ x 4″ painted with tar, spaced every 2 feet of tank length. Use glass insulators, three to each timber, one at each end and one in the center.

The design of the heating coil is important. It should not be attached to the side of the tank in the form of layers or in the form of a loop at the bottom. The former method will take up valuable tank space and may involve the risk of electrical grounds because of the proximity of the coil to the anode bar. The latter method would necessitate the removal of the anodes in order to get at the coil in case it should leak.

The best way is to fasten the coil to one end of the tank along the bottom, with the inlet at one end and the outlet at the other. Use small pieces of porcelain insulators under the coil to keep it off the tank bottom.

For the nickel tank I prefer anodes of the oval type, 99% plus rolled, depolarized. They should be 36″ long with hooks 4″ long of the "self-contact" or knife-edge type. Attach the hooks and encase the anodes in a good type of filter bag. Keep the anodes, until ready for use, in a pile on clean paper on the floor in a place where they will not be in the way.

Anode rods may be supported in the center by a piece of hardwood, about 2″ x 2″, the length of which depends upon the height of the anode bar from the tank bottom. Cut a V in one end and mortise a flat piece of wood 2″ x 3″ in the other end. Place the V end under the anode rod at the desired point with the other end of the bottom. This provides a sturdy support.

The nickel rinse tanks may be constructed of wood, about the same size as the other small tanks except for the depth which should be about 4′. This tank will act as a drag-out tank or a replenishing tank for the nickel solution. As the nickel solution level goes down from drag-out or evaporation, it can be replenished from the solution from the first rinse. If the work is to be chrome plated it need not go through a hot water rinse, but can go directly into the chromium after the cold water rinse following the nickel solution.

The Copper Tank and Accessories

In setting the copper tank, use the same method of insulating the bottom and of raising the tank off the floor, as for the nickel tank. The size is 7′ x 3′ x 3½′ with a capacity of 500 gallons. The electrical equipment required will be 1000 ampere rheostat with the ammeter and voltmeter at-

tached, and with a 1000 ampere shunt. The anode and cathode bars are about 1¼" in diameter. The anode rods must be fastened securely at each end of the tank with porcelain insulators. The cathode rods should be attached to an agitator. The anodes should be of the ball type, each ball weighing about 1½ to 2 pounds and about 1½" in diameter. They will be held in cages or holders designed for that purpose, which can be obtained from supply houses. For the purpose of the installation described, use 22 holders, placed about 12" apart on the anode bars.

The steam coils should be of ordinary steel. A seamless steel pipe makes a good coil. It can be heated and bent at each end as it is to be placed in the tank in the same way as the steam coil in the nickel tank, with insulators at the inlet and outlet. Use 1½" to 2" pipe. Temperature of solution should be around 120 deg. F.

Plating and Tumbling Barrels

Plating barrels should be set up so that they can be run from a line shaft. They will be operated at room temperature and will require no heating coil. The plating barrel will be used for nickel as that plate can be put on either with a heavy dull finish or with a bright finish with the aid of the burnishing barrel. This burnishing barrel will be motor driven.

Set the nickel barrel in the same manner as the plating tanks, using glass insulators on the bottom. The anodes are the same as used for the large nickel tank, with the exception of length, which will, of course, be determined by the size of the barrel.

Other barrels to be installed are open end tumbling barrels, ball burnishing barrels and a wooden tumbling barrel. The open end tumbling barrel is used for smoothing the rough corners and burrs off the work and for wet rolling. The ball burnishing barrel is used for brightening small parts both before and after plating. The wooden tumbling barrel is a drying barrel containing clean sawdust and is used after the small parts have been plated and rinsed in hot water. A roll in this sawdust barrel will thoroughly dry them. The sawdust barrel can also be used to clean the small parts before plating.

It is important to avoid confusion between these barrels. There is a wide difference between a steel tumbling barrel with an open end and a completely encased steel barrel lined with wood, such as is used for burnishing. The open end tumbling barrels are all constructed on the same principle; that is, they are open end tilting; they can be set at practically any angle. In emptying, they can be titled forward to let the work roll out into a wire basket or to empty the solutions, etc.

The Cleaner Installation

For the electro-cleaners a single copper bar fastened at the center of the tank will act as a work rod. The tank itself will be the anode. Use a 500-ampere knife switch for each tank in order to use direct or reverse current at will.

The heating coils are of plain iron steam pipe to be installed in layers. Use 1" pipe about 5' long with reverse elbows. Place the lengths about 2" apart. Across the coil, bolt two flat pieces of steel, about 1" wide, so that they extend up and over the side of the tank and can be used to support the coil and keep it from sagging. Insulators will be necessary for this coil at each end of the tank—the same as for the copper and nickel.

The cleaning units and their rinse tanks should be set up before any of the solutions are mixed, as all of the solutions can be prepared at approximately the same time. The small tanks should be raised off the floor like the large plating tanks; all tank tops to be at the same level. Insulate the electro-cleaners; not the rinse tanks.

The cleaning unit should be laid out in the following order:

1. A soak tank (small—about 4' x 3' x 3½').
2. A forced spray rinse tank (small).
3. Electro-cleaner (large—about 6' x 2' x 3½').
4. Warm rinse (small).
5. Electro-cleaner (large).
6. Cold rinse (small).
7. Small tank lined with 6% antimonial lead; 40% muriatic acid dip.
8. Cold rinse (small).
9. Electro-cleaner (large).
10. Cold rinse (small).
11. Small tank lined with antimonial lead; ½% hydrofluoric acid dip.

Tank No. 2 is used as a forced spray rinse. Set the spray around the inside of the tank with the spray directed towards the center. The holes in the pipe may be ⅛", about ¾" apart. The control for this water rinse

Job plating plant for plating small and medium size articles. Installation includes apparatus for mechanical cleaning; acid treatment and dipping; plating for nickel, brass, copper and cadmium; ball burnishing; automatic rinsing and drying; and generator equipment. Monorail and hoists further facilitate handling. Courtesy, U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

can be located on the floor in the form of a foot valve. Cut a 4″-hole, square or round, in the bottom of the tank to serve as a drain. Tank No. 1 contains a solution known as a "wetting" agent that is, having the property soaking into the dirt, such as polishing greases, oils, coloring compounds, etc., loosening it sufficiently so that a good spray will remove the worst of it. Subsequent electro-cleaners will remove the balance.

After tank No. 11 there is no rinse but the work is placed directly in the nickel bath. This dip will neutralize any alkali remaining on the work and at the same time is not strong enough to be harmful to the nickel solution.

The inlets and overflows for the cold rinse tanks require careful attention, as the tanks are small. A satisfactory method is to place a T at the water level in the inlet pipe line. Extend the shank of the T down into the tank about 2½′, with an open end. Connect a short piece of pipe to the cross of the T with ⅛″ holes drilled in a row about ¾″ apart. Cover the open end with a pipe cap. This will give a clean spray of water on the work, and will also be economical in the use of water.

Mixing the Nickel Solution

Fill the tank half full of clean water. Heat to 160 deg. F. and add single nickel salts; (see formula below). Stir well until nearly all the salts are dissolved then add the nickel chloride and stir this mixture until no trace of the salt flakes remains. It may be necessary to add more water to take up these salts. If so, use as little additional water as possible. Add the boric acid in powdered form. This material will float on the top of the solution and will be hard to dissolve. Put on a pair of rubber gloves and break the lumps between the fingers. (It is good practice to use rubber gloves in handling any of the chemicals). If boric acid crystals are used, they will go directly to the bottom of the tank and it will be difficult to know whether or not they are dissolved.

After the boric acid is added, add more water, about enough to bring the solution level to within 15 inches of the top of the tank.

At this stage, it would be well to place the platforms in position at the tank as the nickel anodes are heavy and can be handled more efficiently with a minimum lift distance. Place the anodes in the tank, shoulder to shoulder, about 1″ apart, a row in the center and a row on each side. Be sure to place the wooden supports under the anode bars before loading too many anodes on the bars.

Now that the anodes are all in the solution, it will be clear, of course, that the solution level has risen. Add clean water until the solution reaches about ½″ below the shoulder of the anodes.

All that is necessary now to make the nickel tank ready for use is to add the brightener and adjust the pH. The pH should be adjusted with the quinhydrone calomel electrode (saturated) instrument. The actual pH of the solution varies with the type of brightener used, from 3.0 to 5.8.

There is no anti-pitting agent that we can recommend for this bath as the brightener usually contains some pitting preventive. Hydrogen peroxide is used in the normal nickel bath with good results, about 1 pint to each 200 gallons of plating solution.

Nickel

Single nickel sulphate	42.75 ozs.
Nickel chloride	4.5 ozs.
Boric acid	4.5 ozs.
Water	1 gal.

Operate at 120 to 140 deg. F., 25 to 50 amperes per sq. ft.

Barrel Nickel

Single nickel sulphate	12 ozs.
Double nickel salts	6.0 ozs.
Ammonium chloride	3.0 ozs.
Boric acid	4.0 ozs.

Operate at room temperature; 10 to 25 amps. per sq. ft. The pH may be determined colorimetrically and should be 6.0 to 6.2. If the quinhydrone cell is used the reading should be 5.4 to 5.7 and this will be equivalent to the higher readings from the colorimetric test.

Mixing the Cyanide Copper Solution

In preparing the copper cyanide bath it is necessary to take precautions against the fumes and keep the hands free from sodium cyanide. Hence we use a respirator and wear rubber gloves.

Fill the tank two-thirds full of clean water, heat to 170 deg. F., add sodium cyanide and let it dissolve. Now stretch a piece of doubled cheesecloth across the tank and fasten it in the form of a hammock. Place the copper cyanide in this hammock a little at a time until all the copper cyanide has been dissolved. Then add the soda ash.

After the solution has been made up, place the anodes in position and bring the solution level up to about 3″ or 4″ from the top of the tank.

When the tank has cooled to about 120 deg. F., the bath is ready for use.

A brightener can be made up by using 1/64th of an ounce of sodium thiosulphate per 100 gallons of solution.

The formula for the copper bath is:

Copper cyanide	2½ ozs.
Sodium cyanide	3.75 ozs.
Soda ash	1½ ozs.
Water	1 gal.

Operate at 120 deg. F. at 15 to 20 amperes per sq. ft.

Keep the free cyanide content at ¾ oz. per gallon by frequent analysis.

This article will be concluded in an early issue.—Ed.

Non-Tarnishing Silver

Q.—We have been informed that there is a chemical on the market that can be added to silver plating solution which will result in a whiter silver and will prevent the silver from tarnishing.

If you have any information on file regarding this, we would be very pleased to receive a report from you.

A.—It is believed you are referring to the use of rhodium. This is not added to the silver solution but is an additional plate deposited over the silver. Rhodium is a bluish white metal that is resistant to tarnish.

—G. B. Hogaboom, Jr.

Smooth Top Ingots

Q.—We are setting up a plant for the manufacture of brass ingot, and would like to know if you have any information on the pouring of ingots to produce the smooth top surface that is now so essential to the sale.

A.—There are two methods used by some makers of ingot metal for the purpose of producing smooth top ingot: one, to place powdered charcoal in bottom of the ingot mold: the other, to cover the ingot mold with a block of wood, leaving a small pouring hole.

There is a knack in doing it.

—W. J. Reardon.

Lacquers For Metal Products—Part I

Fine finishes are obtained only with lacquers of high quality, suitable for the work, and properly applied. Lacquers for solid copper, brass, bronze, and silver.

By GUSTAVE KLINKENSTEIN

Vice-President and Technical Director
Maas & Waldstein Company, Newark, New Jersey

CLEAR lacquers for finishing products made of brass, copper, silver, and other metals should have the following properties if they are to give satisfactory results.

Properties of Clear Lacquers

The lacquer should be clear and free from mechanical impurities such as dirt or sediment. For use on copper, brass, or bronze, the lacquer may have a yellowish tinge, but this is not permissible in lacquers to be used on white metals, such as silver or nickel.

When mixed with the proper thinner, no cloudiness should form, even momentarily, and the thinned lacquer should flow evenly on a glass plate (which must be clean and free from grease) without streaks, and dry to a smooth film without wrinkles or roughness. When applied on the metal on which it is to be used, the film should be invisible, and in no way change the appearance of the finished metal surface, except, perhaps, to enhance the gloss. Odor should disappear within several hours, or, if necessary, more quickly.

The film must adhere strongly to the metal and be hard and resistant to abrasion, scratching, etc. These properties are tested by means of the finger nail, a knife, or a mechanical device. In addition, the film should be unmarred by finger prints.

"Good color retention" is of special importance for high-grade finishes. By this is meant that the lacquer will not darken and that it will protect the surface of the metal from discoloration for a long period of time. This quality, and the equally important one of the durability of the film in actual service, can be determined by accelerated tests in which lacquered panels are exposed to heat, cold, ultra-violet light, moisture, salt spray, and other conditions that may have to be met.

Similar tests can be carried out on pigmented lacquers, together with an examination of their covering power, fineness of pigment, gloss, etc.

Defects Unfairly Attributed to Lacquers

Lacquers are sometimes blamed for defects in finishes that are in no way due to the quality of the lacquer.

For example, iridescence in clear lacquers is caused by using a lacquer that is too thin. This phenomenon, which is the result of light interference, sets the limit to the thinness of lacquer films. When the thinnest possible film is desired, the lacquer is thinned to the point where iridescence is just prevented.

Blushing—a cloudiness of the lacquer film—is caused by the condensation of the moisture from the air on the film while it is drying. This may be due to the use of the wrong kind of thinner, but, when this happens, the fault can generally be traced to the use of a thinner not recommended by the lacquer manufacturer. Blushing can also be caused by applying lacquer in too cold or too humid a room.

Careless spraying will produce poor results with the best of lacquer. If a sprayer works too close to the product he is finishing, the lacquer may run down in "tears" or "curtains." Of if he works too far away, part of the lacquer may dry before it reaches the product, resulting in a film that has no mechanical strength and soon peels off. There is, of course, no substitute for expert workmanship.

Lacquer Must be Suited to the Product

But, as has been previously pointed out in this series of articles, to produce a fine, durable finish, the lacquer must not only be of good quality; it must also be suited to the metal from which the product to be finished is made, the service to which the product is to be subjected, and the process by which it is manufactured.

There was a time when a few kinds of lacquer were used for a great variety of purposes, but that time has now passed. Almost all modern lacquers are specialties. Each is adapted to a specific combination of conditions and either will not give the best possible service or will cost more than is necessary if it is otherwise applied. Hence, as has been emphasized before, the product manufacturer should not finish a new product with a lacquer supplied for some other purpose, even if apparently quite similar, without consulting the lacquer manufacturer.

The necessity for adapting the lacquer used to the service requirements of the product and the process of manufacture has already been discussed. It now remains to consider some of the characteristics of the various metals from the finishing standpoint.

Lacquers for Solid Copper, Brass, and Bronze

Clear lacquers for protecting the finish of solid copper, brass, and bronze products have been supplied for so long a time that they are about as well standardized as any of the products of the lacquer manufacturer. The finishing requirements of these metals are, in general, much the same, and lacquers suitable for one can often be used on the others for products to be used indoors. For products intended for outdoor use, more discrimination in the selection of the lacquer is required, since the decomposition products of these metals and

alloys differ and the composition of the lacquers used must be varied accordingly.

Special care is required for the finishing of "oxidized" brass or copper products—that is to say, products treated with a sulphide solution to darken the surface. The coating of copper sulphide thus formed is very sensitive to the action of sulphur, and, when an "oxidized" product is lacquered and is then exposed to sulphur from any source, small crystals of copper sulphide are apt to appear beneath the lacquer, causing a defect known as "crystal spotting." The lacquer, if free from sulphur, does not cause the formation of the crystals but it holds them in place if they do form.

To minimize crystal spotting, "oxidized" products must be kept away from coal gases and other atmospheric sources of sulphur, and only sulphur-free wrappings must be used. Paper mills now supply sulphur-free paper for this particular purpose, but it is always advisable to analyze wrapping materials before using them.

Obviously, however, no amount of care on the part of the manufacturer can protect his products from atmospheric sulphur when they are on the dealers' shelves or in service. In consequence, lacquer manufacturers have undertaken to produce lacquers that tend to inhibit the formation of the crystalline spots. These special lacquers are now available and should always be used for finishing "oxidized" products. They cannot prevent crystal spotting under all circumstances, but they reduce the trouble to a point where it is no longer a matter of serious concern.

Lacquer-enamels, or pigmented lacquers, for solid copper, brass, and bronze products are supplied in all colors, in opaque or transparent pigments, and in all grades of gloss. For many finishing requirements, a single coat of lacquer-enamel suffices; but for better results, an undercoat of lacquer-enamel is given a top-coat of clear lacquer, which may dry with its own gloss or may be buffed. Where a very durable finish is required, the lacquer-enamel can be applied over a primer coat, which is baked or air-dried on the metal, with or without a top coat of clear lacquer.

Lacquers for Silver

Lacquers for silver must be "star bright and water white"; that is, they must be perfectly colorless, transparent, and free from specks. Both the lacquer bases and the solvents used for silver lacquers must be of the highest purity, and, in some cases, they are prepared by special processes to eliminate all traces of a yellow color. As even the most minute particles of dust will form spots on the gleaming surface of a silver cup or candlestick, the finished lacquer is examined microscopically, or even magnified by a projector on a screen, in order to make sure of its perfect clarity.

As silver darkens very readily, the lacquer film must not react in any way with the metal. It must also be durable enough to protect the surface from the tarnishing effects of the atmosphere for a long period of years.

"Oxidized" silver products will crystal-spot, like "oxidized" brass and copper products. Consequently, the lacquer used for such products must be of a very special nature.

Tinplate by Electrodeposition

Problems in connection with the production of tinplate by electrodeposition instead of by the older established hot-tinning method are discussed in a paper recently read before the Electrodepositors' Technical Society by D. J. MACNAUGHTAN, W. H. TAIT, and S. BAIER, under the title "*Electrodeposition and Polishing of Thin Coatings on Steel.*"

Recent developments in the rolling of large ingots of steel into continuous strip suitable for tinplate manufacture have created the need for a satisfactory continuous tinning process. Difficulties with the hot-tinning method have stimulated work on electrodeposition which is so often adaptable to continuous conditions. In this paper, various factors affecting the nature of the tin coatings produced by continuous electrodeposition on a strip two inches wide have also been investigated.

The characteristics of both alkaline and acid baths are discussed; satisfactory coatings were obtained with each but the acid bath is preferred. With the acid bath it would appear to be possible to electro-tin at speeds comparable with those used in hot-tinning, while keeping the length of the bath within practical limits.

Coatings vary from rough matte to smooth matte or even semi-bright but all require polishing to make them bright. Quantitative data on polishing were obtained by means of a specially devised apparatus, allowing control of the pressure and speed of the polishing mop. By providing a transverse movement for the specimen the amount of polishing given to parallel strips could be controlled, and the drag of the specimens under the mop was also measured. With the various polishing materials investigated the loss due to polishing ranged from 7 to 20 per cent of the weight of the coating; for smooth matte it was about 10-13 per cent and porosity was doubled by it. Scratch-brushing caused less loss than polishing, but the porosity was much greater except in the case of brass-wire brushes which did not increase it much.

In a supplementary paper D. J. MACNAUGHTAN and J. C. PRYTHERCH described the "*Effect of Deformation on the Protective Value of Hot-Dipped and Electrodeposited Tin Coatings on Steel.*" The electrodeposited coatings produced by the method described in the previous paper were examined to see how they behaved when the strip was deformed. This is important because tinplate is usually deformed during fabrication.

To provide a basis for comparison tinplate made by hot-dipping was also put through the tests of stretching and close-bending. Commercial samples of hot-dipped tinplate with coatings of 0.00012" and 0.0003" were used and the effect on porosity was examined. The protective value of the coatings in the unstretched condition was very different from that after stretching, smooth matte coatings being greatly superior to the rough matte. The authors discuss the factors responsible for the behavior of the tin coatings under deformation and the possible effect of the steel base.

The above papers have been issued together as Technical Publication Series A, No. 52 of the International Tin Research and Development Council, and copies may be obtained free of charge from the U. S. Representative, L. J. Tavener, 149, Broadway, New York City.

Dust Control in the Foundry

Good foundry housekeeping and the prevention of silicosis make dust control a prime necessity.

By C. A. SNYDER

Dust Control Engineer, The American Foundry Equipment Company, Mishawaka, Ind.

THE basic principles of foundry practice have not undergone radical changes throughout the years; that is to say the practice of pouring the molten metal into a formed structure of sand is substantially the same as when discovered. However, the first foundrymen had little concern over the problem of dust control, need for which has resulted from the present day production speed and efficiency.

There are many good reasons for dust control and abatement, such as providing employees with a clean, healthful place to work, and the prevention of silicosis, a disease which has threatened to become a tool in one of the largest potential rackets in the world.

Foundry Operations Creating a Hazard

Foundry operations which create a dust hazard and where dust control devices are required and can be effectively applied, are:

1. *Sandblasting.* Sandblast rooms should be supplied with sufficient mechanically forced draft to keep the dust created inside the enclosure, and carry it away from operator fast enough to assure ample vision of the work.

2. *Tumbling Barrels.* If the operation of tumbling barrels is necessary on certain types of work to secure a burnished finish, they should be supplied with ample ventilation. A vent pipe velocity of 4,000 to 5,000 feet per minute will generally supply a sufficient amount of air movement to keep atmospheric dust concentration below the danger point. If there is no exhaust connection, the tumbling mill can be enclosed, ventilation being supplied to the outer structure.

3. *Grinding Wheels.* Effective hoods and proper ducts should be provided and properly maintained for grinding wheels. State Departments of Labor often specify duct sizes and air volumes, and they should be consulted for possible codes. Manufacturers of dust control equipment are in a position to supply the necessary data.

4. *Shakeouts.* In most cases, effective dust suppression can be applied to shakeout systems. Shakeout conditions vary so greatly that each problem must be given individual attention.

5. *Sand Handling Equipment.* As in shakeout equipment, each problem requires special considerations, no set rules being applicable.

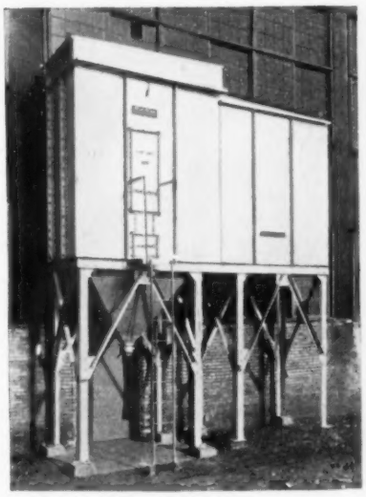
Types of Dust Collectors

There are many types of dust collecting devices available, among which are:

1. *Centrifugal Collector by Blow Pipe Contractor.* These devices are not recommended, as efficiency is never above 70 to 80 per cent by weight.

2. *Multiple Cyclone.* This type of collector has much greater efficiency than the above due to the better application of the centrifugal force which separates the dust from the air.

3. *Wet Collectors.* This type of equipment has attained a fairly high efficiency percentage when based on weight, sometimes ranging as high as 90 or 95 per cent. However, there is much development work to be done before reasonable acceptance can be expected, as much trouble is experienced especially in cold weather, with necessity of anti-freeze solutions. This equipment is not acceptable in states where a rigid inspection is made of the concentration of the discharged air within harmful size ranges.



Installation view of cloth bag type dust collector in foundry.

4. *Cloth Screen Arresters.* These can be installed where requirements are severe, as efficiencies up to 97 per cent are reached.

5. *Cloth Tube or Bag Collector.* Rapidly becoming the most popular type of dust suppression because:

(a) Absence of rigid screen frames allows better cloth cleaning and eliminates cloth wear and possible corrosion due to contact with wires, etc.

(b) More efficient cleaning mechanism, meaning lower back pressure range, longer cloth life, less power consumption.

(c) Ample spacing of filtering units, another factor in the saving of power due to lower resistance to air flow.

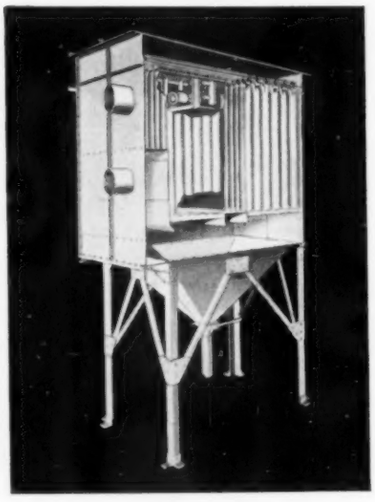
(d) Ease and infrequency of maintenance and inspection. Efficiencies of 98 per cent or more by weight, and dust counts of discharged air showing 10,000,000 particles or less from 2 to 10 microns in size as determined by the impinger method, are obtained with this design of collector.

6. *Electrical Precipitation.* While probably the most efficient of all collecting devices, the high installation cost usually makes its use prohibitive, except in cases where reclaimed dusts are exceedingly valuable.

Each of the above units may have advantages in particular applications,

as many factors must be considered, such as: temperature of air, moisture content, dust concentration, particle size distribution, presence of acids, alkalies, etc. The real test of efficiency in a dust control system is the quantity of particles of a size harmful to human lungs; generally accepted to be between 2 and 10 microns (one micron is equal to one thousandth of a millimeter) which is present in the air, discharged from the collecting unit, together with the quantity surrounding the equipment being served. The most efficient dust collector is useless without proper connections to the equipment creating the nuisance.

It must be impressed upon responsible persons that dust control equipment is not an "unnecessary evil," but rather a profitable investment, which should receive the care and frequent inspection afforded the equipment which it serves. There is need for proper education of supervisors, so that they will be able to instruct employees on the proper usage, and impress upon them the desirability of using equipment installed to provide for them a clean, safe place to work. Executives must acquaint themselves with the work already done in order to prevent severe labor codes and exorbitant insurance rates from being put into effect in their respective states. Manufacturers of dust collecting equipment and many large insurance companies are eager to be of service in matters of this kind.



Cut away view of the dust collector.

Refining a Low-Grade Gold Alloy

Q.—I have an alloy containing about 90% copper, 4% gold, 2% silver and the remainder lead, tin, iron, etc. The United States Bureau of Mines suggested that I write to you regarding it. I would like to recover the gold by an electrolytic process. I now use nitric acid but find it expensive, tedious, and disagreeable.

I have heard of using an electrolyte of copper and silver nitrates with a cathodic deposition of copper and silver; the deposit of more than one metal on the cathode is of no concern to me, since I am primarily interested in the recovery of the gold. However, I do not know the composition of the electrolyte, the current density, the arrangement of the anode or the time required to corrode the anode completely. I would greatly appreciate any information or references you can give me on the subject.

A.—It is true that the acid method you mention is tedious and unpleasant, but if you are handling this metal in small or medium-sized quantities, acid methods, rather than electrolytic methods, are the ones that are most suitable. If you have proper equipment, and know how to remove the troublesome lead, tin, and iron, you can obtain high quality gold and silver. If you have or can obtain alloys of higher value, (especially those that contain platinum), and can work these up in conjunction with your low-grade alloys, the process can be made to pay well, even on a small scale, by the use of proper acid methods and ordinary care.

The composition you mention suggests that perhaps your metal was obtained by melting up old gold-filled or rolled-gold scrap. If so, you may find some points of interest in an article entitled "Reclaiming Gold from Gold Filled Articles," that appeared on page 175 of the April, 1937, issue of METAL INDUSTRY.

References

As to references to articles on electrolytic refining: Most textbooks on chemistry and chemical engineering contain chapters on electrolytic refining. The following also are helpful: WATT & PHILIP'S "*Electroplating and Electro-Refining of Metals*"; T. K. ROSE'S "*Metallurgy of Gold*"; an article by M. A. MOSHER entitled "*Recovery of Precious and Secondary Metals from Electrolytic Copper Refining*" which appears in the Transactions of the American Institute of Mining and Metallurgical Engineers, Vol. 106, page 427. All of these give full details regarding current densities, composition of electrolyte, and so on. An article that is somewhat out-of-date, but still interesting, appeared in THE BRASS WORLD of September 1913, and covered the methods then in use by the U. S. Assay Office in New York City.

Electrolytic Refining

Any discussion of electrolytic refining divides itself into three parts: copper refining; silver refining; gold refining. These methods are employed by the large copper plants, by Mints and by the larger gold and silver refiners. The methods in theory are beautifully simple, but in practice they are suitable only when large quantities of metal, of fairly uniform composition from day to day and month to month, are available. The initial investment is considerable, and highly trained operators are required. We have been informed that several of the smaller refiners who have installed electrolytic outfits have later abandoned them, returning to the tedious acid methods.

The first step—the copper refining—is carried out in huge tanks; large anodes of impure copper (97% to 99%+) are suspended in a copper sulphate bath and are dissolved electrolytically, pure copper being deposited on cathodes which consist of thin sheets of copper already purified. Most of the base metals such as nickel and iron go into solution; the gold and silver drop to the bottom of the tank to form a mud or sludge. In routine work this sludge contains more silver than gold; also small amounts of other metals, including the platinum metals, selenium, tellurium, and arsenic, plus considerable copper. The sludge goes through several cleansing steps, to remove as much base metal as possible, involving roasting, treatment with acid to remove copper and parts of the arsenic, etc.; washing and drying. Finally it is fire refined in a furnace with fluxes, and the remaining metal is again cast into anodes.

These second anodes, much smaller than the copper anodes, are now ready to go through the silver refinery. This step does not lend itself to the elimination of any large proportion of base metals, so these anodes are brought to a high state of purity in the previous steps—995 parts silver-plus-gold, the remaining 5 parts being platinum metals and base metals. The electrolyte is a neutral silver-copper nitrate solution, and the pure silver is deposited in crystalline form on the cathodes, which usually are carbon slabs. Gold and platinum group metals drop down as a black mud, and are caught in muslin bags or trays. Various methods of arranging anode and cathode are employed, differing in mechanics but not in principle.

The mud of gold and platinum group metals is collected periodically from the muslin bags or trays, it is boiled first in dilute and then in concentrated sulphuric acid to remove residual copper and silver, and finally is melted down into the so-called gold anodes.

These third and smallest anodes are now ready for the last electrolytic refining; they may run about 980 parts gold. In some plants anodes as low as 850 fine are used, but normally they are brought up to a fineness of 900 or over, fine gold being added if necessary. These anodes are now electrolyzed in glass or porcelain cells, in a bath containing gold chloride and free hydrochloric acid, kept at 140° F. and stirred by an air lift. Fine gold deposits out on the cathode, and platinum group metals go into solution; any silver will drop out as silver chloride.

The above is a brief and necessarily sketchy summary of these processes, a full description of which would occupy many pages. However, it is enough to indicate that the method is far from simple. One point, not emphasized above, is the fact that much metal is permanently tied up in the process, in solutions, in starting cathodes, etc. This is an important item in silver and gold refining, and is one of the big reasons why the process is not economical in small-scale adaptation. You will also note that considerable refining (by acid and fire methods) is employed *before* the electro-refining begins; thus the silver anodes run 995 parts gold-plus-silver; the gold anodes run 850 fine or better. The smaller refiner might do well simply to carry his acid refining a step further and complete the process by acid means. In fact, such is standard practice in all except the very large gold and silver refineries.

In your own case one can see that it would be a temptation to set up a small cell, similar in principle to the cells used in the first step above, in which your copper anodes would be electrolyzed in a copper sulphate bath. For details consult the textbooks mentioned. Such attempts have been made, but the first obstacle to be encountered is the fact that your alloy contains only 90% copper, and the process is commercially operated only when the copper content is at least 97%. The gold, silver (and lead) would drop down as a sludge, and would be refined by acid methods. Frankly we doubt the economy of this, in quantities such as you handle, with an anode of this composition, even if you are familiar with electrolytic technique and able to regulate the composition of the electrolyte.—JEWELRY METALLURGIST.

Research To Combat Industrial Diseases Caused by Dust and Fumes

A plan of medical and engineering research to combat industrial diseases due to dusts and fumes, potential peril to the health of more than a million workmen, is announced by the AIR HYGIENE FOUNDATION, 4400-5th Ave., Pittsburgh, Pa. The work is to be started as soon as arrangements can be made.

The organization, with headquarters at Mellon Institute, also announces the opening of a drive for broader support from industry to help this research.

The program calls for studies at Saranac Laboratory, Harvard School of Public Health, University of Pennsylvania Hospital, Singer Memorial Laboratory and Mellon Institute, and for work in cooperation with the U. S. Bureau of Mines. The research will seek to discover:

(1) Basic knowledge essential to determine the cause and prevention of diseases attributable to dusts and other industrial air pollutants.

(2) What the employer must do to safeguard the health of his workmen and to protect himself against false damage claims. (*Half a billion dollars* in damages have been filed *against American employers* in occupational disease suits, according to the U. S. Department of Labor.)

(3) Curtailment of the health hazards inherent in silica.

(4) More practical information in the field of chest x-ray.

(5) How to reduce the high pneumonia rate in smoky atmospheres.

H. B. MELLER, Managing Director of the Foundation, explains that "the research program is designed to combat industrial diseases caused by the inhalation of various dangerous dusts, toxic fumes, gases, and other forms of air pollution arising from industrial processes.

"The program is based on the recommendations of the Foundation's Medical, Preventive Engineering and Legal Committees. The committees in turn based their recommendations on the findings of inventory-like surveys made last year and constituting the first part of our program. These surveys show, in a general way, what is known and what remains to be learned about the occupational diseases under investigation."

Approximately 4,000,000 workmen are exposed to nonmetallic mineral dusts in this country, according to U. S. Public Health Service estimates. Not all this number are exposed to injurious quantities. However, this figures does not include various other forms of air pollution, such as metallic and organic dusts and poisonous fumes and gases.

Bluing Guns

Q.—Please give me information on the bluing of guns, formula, operating conditions, etc.

A.—Information on the production of a blue finish on steel appears in the 1937 edition of Platers' Guidebook, page 34, published by the METAL INDUSTRY. This is not the method used in gun works as the method employed is quite a long one and expensive equipment is needed.

A satisfactory color can be obtained by the use of a black nickel plating solution. This is also described in the above Guidebook.

—G. B. HOGABOOM, JR.

Shop Problems CASTING • METALLURGICAL FABRICATION • ASSEMBLING • • PLATING • FINISHING

Questions from readers relating to shop practice and answers by our associate editors

Silver Iodide Solution

Q.—Kindly inform me where I can obtain the ingredients to make up a bath of cadmium iodide-citrate for a silver solution; and the method of putting them together.

Referring to your article of May 1935 entitled Silver from Iodide Solutions.

A.—The details of this solution and its preparation are given in the magazine "Industrial and Engineering Chemistry" for March 1935, page 340.

The chemicals for this can be obtained from any of your local chemical supply houses.

—G. B. H., Jr., Problem 5,590.

Spotted Bright Nickel

Q.—In the attached bag are three samples of brass strikes which have been plated in bright nickel. We would like to know what causes the spots to form as shown on samples.

A.—The samples submitted for examination show that several conditions might be the cause of the spotted nickel deposit. The deposit itself is dull which suggests that the nickel solutions need adjustment.

Solution should be checked for nickel content, brightener, boric acid and pH. This type of solution has to be maintained at proper concentration in order to obtain bright deposits.

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The examination of samples showed that the cleaning operation was not sufficient to remove polishing compounds prior to plating. All dirt, polishing compounds, etc., must be entirely removed in the cleaning operation prior to bright nickel plating or badly stained work will result. Good cleaning is imperative.

If work is not agitated, dull grayish white spots will form on surface of work. Agitation of at least 3 to 5 feet per minute is essential.

Low boric acid content will also produce dull grayish spots known as "orange peel," which is a form of pitting. Frequent analytical checks of boric acid are necessary. Boric acid content should be maintained a proper concentration at all times.

The dull white spots as shown on samples are common on buffed and colored work if items mentioned are not controlled closely.

—T. H. C., Problem 5,591.

Zinc, Cadmium or Nickel Before Chromium

Q.—We have a request from our trade who insist that a rust proof coating such as zinc or cadmium plate be given some of our steel parts before they are chromium plated. Our plater states that a heavy coat of nickel over a heavy coat of copper will be just as durable and give a much better finish.

There seem to be such varied and contradictory opinions on this subject that I am taking the liberty of addressing you with a request for some definite information so that we can come to a final decision in this matter.

Use this Blank for Solution Analysis Information

Fill in all items if possible.

Date .....

Name ..... Class of work being plated: .....
Address ..... Volume used: .....
Employed by: ..... Solution depth: .....
Kind of solution: ..... Cathode surface, sq. ft.: .....
Tank length: ..... width: ..... Kind of anodes: .....
Anode surface, sq. ft.: ..... Distance from cathode ..... Original formula of solution: .....
REMARKS: Describe trouble completely. Give cleaning methods employed. Send small sample of work showing defect if possible.
Use separate sheet if necessary. _____

NOTE: Before taking sample of solution, bring it to proper operating level with water; stir thoroughly; take sample in 2 or 3 oz. clean bottle; label bottle with name of solution and name of sender. PACK IT PROPERLY and mail to METAL INDUSTRY, 116 John Street, New York City.

A.—The use of deposits of zinc and cadmium on steel prior to the deposition of chromium have proved entirely unsatisfactory. It is generally known that deposits of chromium are inclined to be porous with the result that the undercoatings of cadmium or zinc corrode rapidly causing lifting of the chromium deposit.

When zinc or cadmium is used alone as a corrosion resistant coating, its ability to protect the base metal is dependent upon the fact that surface corrosion takes place on the zinc or cadmium. This surface corrosion prevents corrosive agents from attacking the base metal.

A good practice and one generally recognized is to deposit a thickness of nickel at least .0004" to .0005" prior to chromium plating. This will produce a compound plate that will withstand atmospheric corrosion. It is necessary to color buff the nickel prior to chromium plating if a bright nickel deposit is not available.

—T. H. C., Problem 5,592.

Aluminum Alloy for Marine Work

Q.—What is a good aluminum alloy for marine use?

A.—An aluminum alloy such as you desire for marine work contains silicon and nickel and one of such mixtures is made up of:

91 aluminum
5 silicon
4 50-copper—50 nickel alloy

—W. J. R., Problem 5,593.

Analyzing Plating Solutions

Q.—I should like some information on analyzing electroplating solutions, gravimetric, volumetric, qualitative, quantitative. I want the simplest and most accurate methods generally used in plating shops.

A.—The whole subject of chemical analysis can be divided into two broad divisions:

1. Qualitative.
2. Quantitative.

A qualitative analysis determines *what* elements, or radicals (such as sulphate, or nitrate) are present in an unknown material.

A quantitative analysis will determine *how much* of a substance is present in a sample of material. It presupposes that the substance sought is present in the sample.

There are two methods of quantitative analysis the volumetric and the gravimetric.

In the volumetric method the sample is brought into solution. This solution is then treated (titrated) with a standard solution, which will act with the substance being tested for. Each cc of the standard solution indicates a certain definite amount of the substance present. The end point of the reaction is indicated when the solution changes color (due to an indicator added for the purpose) or some other sign such as the formation, or the disappearance of a precipitate.

In the gravimetric method of quantitative analysis the substance being sought is precipitated in some form and then filtered out. The weight of the precipitate is found and from this the amount of the substance sought. This method is more accurate than the volumetric method, inasmuch as weighings can be performed very accurately. The volumetric method, however, is usually the most rapid, and for plating plant work it is amply accurate.

Colorimetric sets are in wide use and considered accurate enough for most work.

Methods of analysis can be found in the 1937 edition of *Platers' Guidebook.*

—G. B. H., Jr., Problem 5,594.

Barrel Plating

Q.—We are considering putting in barrel plating equipment for plating cold rolled steel parts, using cadmium or bright zinc as a rust resisting plate for the steel and covering either of these plated finishes with a light brass plate. We plan to use two barrels with only a rinse between the cadmium or zinc and the brass, and we write to inquire if in your opinion the combination of these two plated finishes is practical and if the work can be done successfully in barrel equipment. The brass finish over the rust resisting plate is only intended for decorative purposes.

A.—The brass finish over cadmium, or zinc, is not an especially good procedure for two reasons. First, there will be a tendency for the zinc or cadmium to absorb the brass so that in time the brass will disappear. The length of time required for this action will be effected by the temperature at which the piece is stored and also on the thickness of the brass deposit. Second, the couple formed between brass and cadmium or zinc, will cause the zinc or cadmium to be attacked and thus reduce the amount of cadmium or zinc available for protection of the steel.

If a very light brass plate is applied the latter action may not be serious for your type of work.

It is feasible to go from a cadmium or zinc plate with one rinse provided not too much of the cadmium or zinc is carried over so as to effect the color of the brass. It is assumed that the work only is to be transferred from one solution to the other. It would not be advisable to transfer the entire barrel as the amount of drag-out solution that would be carried over would be considerable.

—G. B. H., Jr., Problem 5,595.

Bronze Tablet Background

Q.—We would also like to ask, in making patterns for bronze tablets, how the rough background on them is obtained.

A.—The material used in making patterns for bronze tablets to secure the background desired is called Buckram cloth. It can be purchased in any large drygoods store; comes in different patterns.

After you select the one you desire, glue it on to the pattern, after which you place the required lettering.

—W. J. R., Problem 5,596.

Anodic Oxidation

Q.—In the place where I work they have an installation for the anodic treatment of aluminum using sulphuric acid. It is called the Alumilite process. They use 250 volts. According to what I can learn the solution stands at 83° Baume.

Please give me some information of the Alumilite process for my own advancement.

A.—For details on this process we refer you to the Aluminum Co. of America, Gulf Bldg., Pittsburgh, Pa.

The operation is simple in principle. A solution of chromic acid is used, either 5% or 9.5% in strength. The work is made anodic. The voltage must be kept at 40 volts for a specified period of time. The oxygen released at the surface of the work produces the aluminum oxide film.

Details on the process also appear in the 1937 edition of the *Platers' Guidebook.*

—G. B. H., Jr., Problem 5,597.

Metal Casting Digest

Short abstracts of articles of interest to practical non-ferrous foundrymen and metallurgists

By H. M. ST. JOHN
Associate Editor

THERMAL TREATMENT OF ALUMINUM CASTINGS FOR PISTONS IN AIRPLANE MOTORS. V. O. Krenig and A. S. Ball. Trans. Research Inst. Aircraft Materials, No. 28 (1935). From Chemical Abstracts, Vol. 30, 8113.

An investigation of the properties of aluminum alloys showed that the best alloys for pistons are: 4.0 copper, 1.5 magnesium, 2.0 nickel (I); 4.0 copper, 1.5 magnesium, 1.0 nickel (II); 10.0 copper, 1.5 iron, 0.3 magnesium, 0.4 silicon (III); 12.0 copper, 1.0 nickel (IV). Best conditions of heat treatment for these alloys are for I and II, heating at 515 ± 5° C. for 3 hours, quenching in boiling water and annealing at 250° C. for 3 hours; for III, heating at 515 ± 5° C. for 3 hours, quenching in boiling water and annealing at 250° C. for 2 hours; for IV, heating in oil at 250° C. for 2 hours. The use of boiling water prevents formation of cracks.

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THE MODIFICATION OF EUTECTIC STRUCTURES IN CASTINGS. E. Scheur. Metal Ind. (London), Dec. 4th, 1936, page 553.

The properties of castings depend largely on the crystal structure. The ability to control structure is a matter of great importance. A most interesting and little understood method is that used in the production of alpax, known in Germany as silumin. If aluminum containing 12 to 13% silicon is treated with sodium fluoride at about 900°C (1650°F) the large needle-shaped crystals of silicon normally present in the alloy are transformed to much smaller rounded grains and all mechanical properties are greatly improved. Metallic sodium and other sodium salts produce the same effect, leaving, for best results, about 0.015% sodium in the alloy. Other addition agents produce varying degrees of grain refinement but, with the exception of lithium do not result in the characteristic rounded shape of grain. Somewhat similar results have been obtained with eutectic mixtures of other metals. The author believes that modification by means of addition agents may be applied to the range of alloys in which the matrix is substantially softer than the embedded crystals, provided the latter are normally brittle and not too small.

• • •

CHOICE OF DIE-CASTING ALLOYS. A. C. Street. Metal Ind. (London), Dec. 11th, 1936, page 586.

Cost is usually the most important but not the only important factor. Zinc is stronger than aluminum, uses a cheaper die, gives a longer die life and is capable of producing a finer detail. Cast threads are not satisfactorily produced in aluminum die castings. Aluminum castings are lighter, have greater resistance to vibrating stress and lend themselves better to gravity casting in cases where the latter process is to be preferred.

• • •

RECENT TRENDS IN THE DEVELOPMENT AND USE OF COPPER ALLOYS. Anon. Metallurgia, December 1936, page 42. A review.

• • •

METALS AND ALLOYS IN THE PRINTING INDUSTRY. B. W. Gonser and S. Epstein. Metals & Alloys, Jan. 1937, page 3. A descriptive, illustrated review.

• • •

SCOOP SAMPLING OF MOLTEN BRASS. L. Kroll, E. A. Anderson and F. E. Ball. Metals and Alloys, Jan. 1937, page 25.

An improved method for sampling molten brass in order to study shrinkage, gas inclusions, etc.

• • •

CONSTRUCTING BRASS FURNACES. Anon. Foundry, Jan. 1937, page 27.

Discusses the location and installation of coke-fired pit-type crucible furnaces.

• • •

LEAD IN SILICON BRONZE MAY CAUSE TROUBLE. N. K. B. Patch. Foundry, Jan. 1937, page 34.

Since silicon bronzes machine more like steel than like brass, an attempt is sometimes made to improve their machinability by the addition of lead. This results in the formation of lead silicate, with resulting flaws and hard spots (glass slag) in the castings.

• • •

ADHERENCE OF ANTIFRICTION ALLOYS IN BUSHINGS. Albert Portevin. Metal Progress, Jan. 1937, page 71.

Adhesion of babbitt to a bearing backing may be prevented by oxidation or dirt between the two or by the formation of a brittle compound between the tin and the iron or copper of the backing. A patented method to provide a non-brittle intermediate layer which will adhere to both babbitt and backing involves the use of a copper-lead or copper-thallium alloy. The copper forms a solid solution with the backing, the lead or thallium with the babbitt. A bearing so made can be broken open and bent in the direction opposite to its normal curvature without loosening the lining from the backing.

• • •

NATURAL BONDED MOLDING SANDS OF CANADA. Correl H. Freeman. Can. Dept. Mines, Mines Branch Rept. No. 767 (1936); Chem. Abstracts, Vol. 31, 347.

Includes a discussion of synthetic or artficial molding sands, reclaiming used sands, physical properties and methods of testing.

• • •

THE USE AND CARE OF CRUCIBLES. H. N. Bassett. Foundry Trade Jour. Vol. 55, page 339 (1936); Chem. Abstracts, Vol. 31, 347.

Correct handling and storage of plumbago crucibles are detailed.

• • •

DESIGN OF DIE CASTINGS. A. C. Street. Metal Ind. (London), Dec. 18th, 1936, page 606.

For the sake of production and economy, parts to be die cast should be as simple as possible in design. Long cores anchored at one end only and complicated die-opening movements are to be avoided.

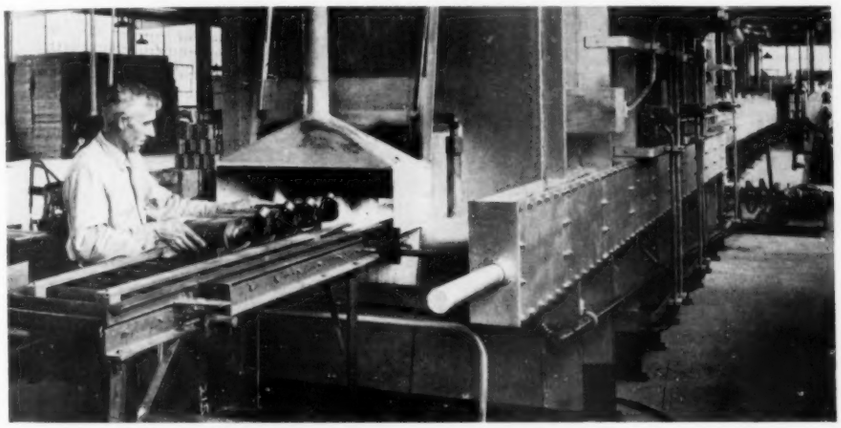
Modern Production Equipment

New processes, machinery and supplies for metal products manufacturing and metal finishing

Roller-Hearth Furnaces

Two leading manufacturers of automobile heaters, Sunday Products, Inc., Detroit, Mich., and the Novi Equipment Company, Novi, Mich., recently installed new G-E roller-hearth electric furnaces for copper brazing heater cores. The furnaces are duplicates. They are 100 feet long, rated 258 kw., and are designed to operate at 2050 degrees F.

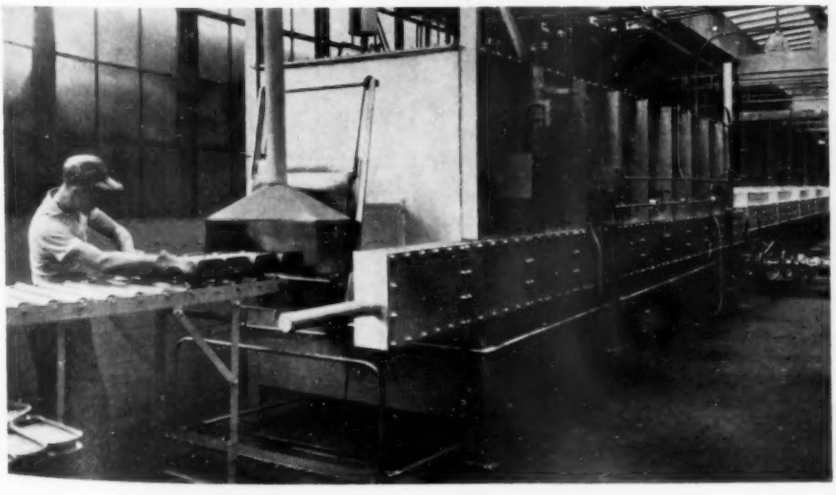
The output of these two companies is



Roller hearth electric brazing furnace at Sunday Products, Inc., Detroit, Mich.

used mainly by one large manufacturer in its cars. Marked superiority in both construction and performance when compared with earlier types is claimed for these heaters. They deliver greater quantities of air at higher temperatures and the electric-furnace-brazed assemblies have uniformly tight, strong, and ductile bonds, free from stresses caused by localized heating. In fact, the units are well annealed as they come from the furnace. Surfaces are left clean and bright because of the absence of flux and oxides on the assemblies—a condition made possible by a controlled atmosphere in both the heating and the cooling chambers of the furnaces.

The roller-hearth-type furnace offers new possibilities in large-scale electric-furnace brazing because of its low operating cost and low maintenance expense per unit of product. The assemblies to be brazed are loaded on lightweight carriers, such as small cast-alloy rails of I-beam or T-beam sections, or on light trays. Thus there is the least possible dead weight to heat and the smallest conveyor replacement. When replacements in the conveying system are necessary, the rolls in the hot zone are generally the only ones affected. Also, the ribbon resistors, 80 per cent nickel—, 20 per cent chromium-alloy, used in these furnaces are long-lived. Another advantage of the roller-hearth furnace is that it is equally suitable for all weights of work—light, medium, or heavy.



Roller hearth electric brazing furnace at Novi Equipment Co., Novi, Mich.

Latest Products

Each month the new products or services announced by companies in the metal and finishing equipment, supply and allied lines will be given brief mention here. More extended notices may appear later on any or all of these. In the meantime, complete data can be obtained from the companies mentioned.

Controlling Down Time. Two new instruments ("Chronologs") for measuring and controlling the time during which an instrument is idle. NATIONAL ACME CO., 118 E. 131 St., Cleveland, Ohio.

Cartridge Type Heating Unit. Small heater for use where a "spot" of heat is required within a limited space; ⅜" in diameter; operating temperature up to 750 deg. F. GENERAL ELECTRIC CO., Schenectady, N. Y.

Metal Spray Gun. Multiplex gun for depositing metal from any kind of wire on metallic or non-metallic surfaces. WM. M. BRITTON CO., Stephenson Bldg., Detroit.

Disc Sanders. Two new models of the 7-inch disc sanders; one for heavy duty and one for constant production service. SKILSAW, INC., 3345 Elston Ave., Chicago, Ill.

Contour Sawing Machine. Metalmaster. For performing machining operations usually carried out by shaping, milling, lathe work or torch cutting. CONTINENTAL MACHINE SPECIALTIES INC., Minneapolis, Minn.

Rubberized Cotton Gloves. Canvas gloves covered with high grade Latex rubber stock. M. L. SNYDER & SON, 116 N. 3rd St., Philadelphia, Pa.

New Type Industrial Building. Provides broader factory aisles, unobstructed head room to full ceiling height, and maximum uniform daylight throughout for single story buildings. THE AUSTIN CO., 16112 Euclid Ave., Cleveland, O.

Laboratory Furnnace. Cyclone type; temperatures up to 1250 deg. F. Lindberg Engineering Co., Chicago, Ill.

(*Continued on page* 356)

Electric Laboratory Flask Heater. Harold E. Trent Co., 618 N. 54th Street, Philadelphia, Pa.

"Disc-Brake" Motor; for small cranes, hoists and auxiliary movements on machine tools, etc. Reliance Electric & Engineering Co., 1088 Ivanhoe Rd., Cleveland, Ohio.

First Aid Kit for Industrial Use. Brac-Kit. Davis Emergency Equipment Co., Graybar Bldg., New York City.

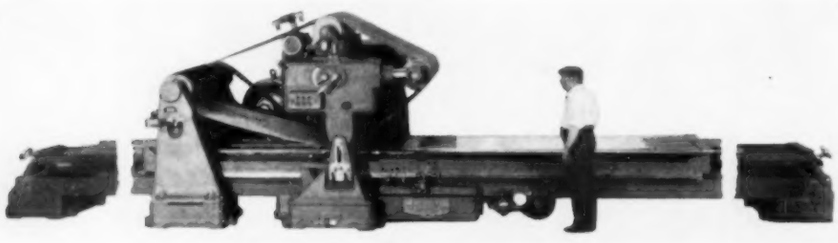
Wide Belt Sheet Grinder

For grinding stainless steel and other alloy sheets factory coated abrasive belts have been demonstrated to be most efficient and economical. Scientific factory preparation produces belts that cut evenly and uniformly throughout their entire surface, providing a superior finish with even texture and greatest economy.

The Mattison No. 453 wide belt sheet grinder made by the Mattison Machine Works, Rockford, Ill., is specially designed for the proper application of factory coated abrasive belts to the grinding of stainless steel and other types of alloy sheets.

Construction, it is stated, adapts itself for quick application of belts. Push button station and controls for table are located at front of machine for easy access by operator. Contact rolls are removable and rolls of any degree of cushion may be easily substituted according to the nature of the work.

The grinder can be furnished in various widths and lengths. Cut shows machine made to carry belts 50" wide to grind sheets 48" wide by 14' long.



Mattison No. 453 wide belt sheet grinder

Cantilever Jar Squeezer

A new foundry squeezer is being manufactured by Tabor Mfg. Company, 6225 Tacony St., Philadelphia, Pa., called the Cantilever Jar Squeezer. Among the several new features is the new design of its tripod or three point support. The construction is such that whether the concentration of the pressure on the ramming block is central and uniform or at one side or the other, the entire force is still within the triangle. This eliminates the tendency to shift sidewise.

Another feature is the squeezing piston, which is the Tabor top squeezer turned bottom side up. It is stated that the life of a cup leather washer on a smooth drawn steel cylinder is almost endless; it will not leak. When it does wear out all that is necessary is to put in a new leather cup.

Another feature is a pop-throttle valve with replaceable seats. This valve, it is stated, will stand a great deal of use and stay tight. It can be kept tight indefinitely by replacing the composition seats when worn.

The machine is easily portable.

Tabor cantilever jar squeezer

Chemicals for Metal Finishing

A wide variety of chemicals for metal finishing is made by The Glyco Products Co. Inc., 148 Lafayette St., New York City. These are described fully in their technical catalog "Chemicals by Glyco."

Hydrowax N is an emulsion of hard carnauba wax, which it is stated, gives transparent durable, water-repellant films on drying and is an excellent polish of the rubless or bright drying type.

Diglycol Laurate which is a light straw-colored oily liquid, self-emulsifying in water and completely soluble in alcohol, hydrocarbon solvents and oils, is recommended as a polish for many types of manufactured products including the automobile finishes. In this respect it is suggested as an emulsifying agent for automobile polishes.

Sulfatate is a wetting agent for use with acids, salts, hard water and alkalies. It comes in liquid form. Although in cold weather it has a tendency to crystallize, it can be restored to its original form by warming slightly. By reducing surface tension it increases the wetting, penetrating and spreading powers of water solutions.

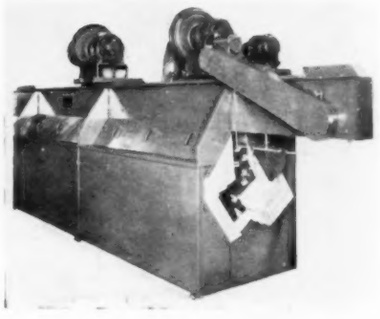
Wetanol is another wetting agent which is as effective in acids, salts, hard water and alkalies as it is in neutral solutions. A stock solution is made by dissolving 1 to 2 per cent Wetanol in water. About 2 to 5% of this stock solution is sufficient for most purposes.

Drying Machine

A new type of drying machine, operated by cold and hot blast for the spotless drying of plated parts has been produced by the Metalwash Machinery Co. Inc., 117 E. 24th St., New York.

One such machine is used for the drying of tin plated evaporator boxes for refrigerators. The parts, after plating, are rinsed in clear cold water, and are then passed through the machine, in the first compartment of which they are subjected to blasts of cold air which strip off perhaps 85 to 90% of the large globules of moisture leaving on the parts only a film of moisture, which is then evaporated in the hot blast section.

It is claimed that this type of drying results in practically spotless work so that the necessity for final buffing operations for the removal of water spots or stains is eliminated. The machine can be applied to a wide variety of plated work, either racked or hung individually.



Metalwash drying machine

Wire Brushes for Sheet and Strip Metal

Spiral wound brushes which are said to effect a great reduction in metal finishing costs, are being marketed by the Pittsburgh Plate Glass Co., Brush Division, Baltimore, Md. They are used in both the steel and tinplate industries to cut the cost of continuous strip and sheet production in both scrubbing and finishing operations.

These new "Even Trim Spiral Wound

Spiral wound wire brush

Brushes" are available in nickel silver wire, horsehair and tampico, each for specific types of work. All are refillable.

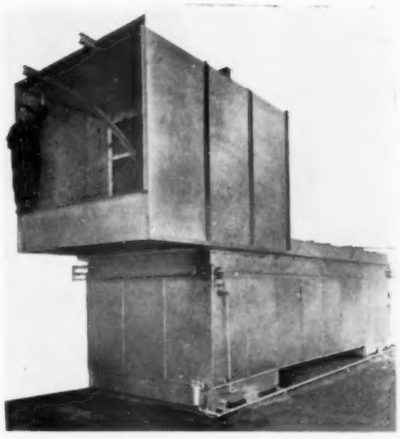
These new brushes are said to not only reduce finishing costs but to improve the appearance of the product as well. According to the manufacturer, the spiral winding eliminates brush marks.

Automatic Degreasing Machine

A new degreasing machine of the vapor spray vapor type is the latest product of G. S. Blakeslee & Co., 19th St. & 52nd Ave., Chicago, Ill. This automatic machine is now in use in Detroit for cleaning various stamped metal parts for automotive manufacturing prior to painting.

The metal parts are suspended from a monorail conveyor and carried through the machine in a continuous line. The line is of the "U" bend type in which the conveyor enters and leaves the degreaser at the same end. The parts are cleaned, dried without stains, streaks or runs thereon.

The solvent used is Blacosolv, a chlorinated hydro-carbon which is readily reclaimed and separated from the oil through an auxiliary distilling apparatus installed on the larger type of degreasing machines made by G. S. Blakeslee & Company.



Blakeslee automatic degreaser

Sand Conditioner

The Beardsley & Piper Company, 2541 N. Keeler Ave., Chicago, Ill., have designed and developed a revolutionary type of foundry sand muller, the "Speedmullor," and are now offering this unit to the industry. The maker claims that centrifugal force is advantageously used to mull more sand thoroughly, in less time, with great economy in power consumption and operating costs.

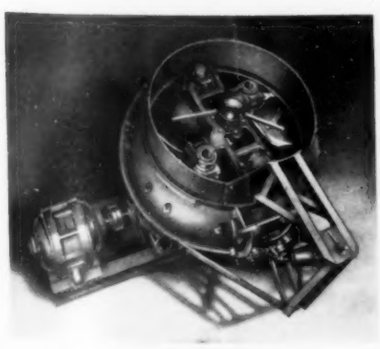
The Speedmullor is designed to mull with equal facility facing, backing or compound and oil core sands.

The mulling mechanism consists of a cross head mounted on a vertical shaft revolving at approximately 90 R.P.M. from which two 20" diameter rubber-covered spherical mullers are pivotly supported, to swing outward by centrifugal force, being adjustable as to throw.

The cross head is equipped with two outside and two inside plows for delivering sand outwardly, inwardly and upwardly, and for holding the sand in suspension in the path of the mulling balls and the spherical side walls of the bowl, thereby delivering all of the sand of the batch into the effective muller track area while subjecting it to approximately two mulling and four aerating actions per revolution.

The wear-resisting muller bowl has a 5' 2" inside diameter, and is equipped with an air cylinder operated side dump, discharge door with remote control for instantaneous discharge of the muller sand.

The Model "G" 10 cubic foot capacity Speedmullor is illustrated, but other models of smaller and larger batch capacity are made.



Beardsley & Piper Sandmullor

Brushing Rubber

The laboratory of Collord, Inc., 1430 Rosedale Court, Detroit, Mich., has developed a new kind of rubber protective coating in paint form, called Surfaseal brushing rubber. Surfaseal is a true rubber paint. The vehicle used is 100 per cent rubber, the total solids are 50 per cent rubber.

The method of application is by brushing or dipping. It brushes very much like ordinary paint and dries to a smooth flat finish possessing a decided gloss. Surfaseal is said to be self-bonding to ordinary clean metals. Two coats are suggested for ordinary usage but as many as six coats are recommended for the most severe service. The drying time will average 4 to 8 hours for each coat. Colors are standard in black, gray, tile red, aluminum. Special colors may be had on special order.

Surfaseal comes in two grades: No. 3 which has a high gloss, a harder finish and will resist acids and oils. The other grade is for the seamless lining of tanks, especially for bright nickel plating. It can also be used for coating hoods, ventilators, exhaust fans, etc.

New Wheelabrator Tum-Blast

A new model Wheelabrator Tum-Blast unit has been placed on the market recently by the American Foundry Equipment Co., 408 South Byrkit Street, Mishawaka, Indiana.

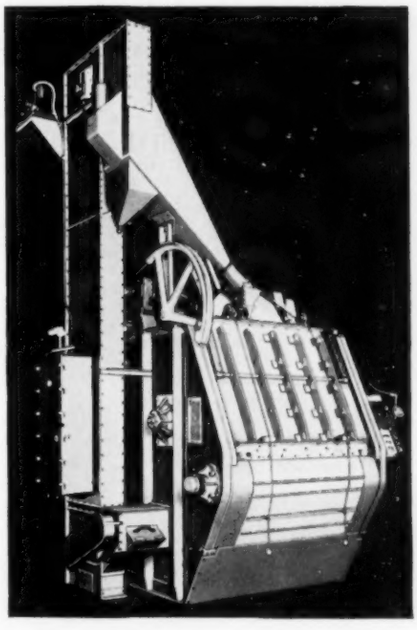
This unit is much larger than any equipment of this type offered to the trade, heretofore, and is to be known as the 48" x 48" Wheelabrator Tum-Blast. Designed primarily for heavy duty service in cleaning reasonably compact castings and forgings weighing up to 300 pounds and having an operating load capacity of 20 cubic feet.

Many new features are incorporated in the design of this new equipment. A counter-balanced, power-driven door, opening and closing at the touch of an electric control button, is installed at a 65° angle to permit loading by either an American Skip Bucket Loader or by an overhead crane.

An auxiliary hopper and screw conveyor, installed in a pit beneath the machine, reclaims abrasive which rebounds beyond the return abrasive conveying system and is included as standard equipment in this unit.

A new suction type abrasive separator removes dust, broken down abrasive, burned molding sand, forging scale and other foreign particles from the abrasive before it is delivered to the wheel.

A new safety method is utilized in the 48" x 48" Wheelabrator Tum-Blast, said to prevent damage to the machine through the carelessness of an operator. Controls are arranged so that the door cannot be opened while the machine is in operation; and the loader cannot be raised to charging position nor the conveyor reversed for discharging the load, while the door is in a closed position.



48" x 48" Wheelabrator Tum-Blast

Industrial Heater

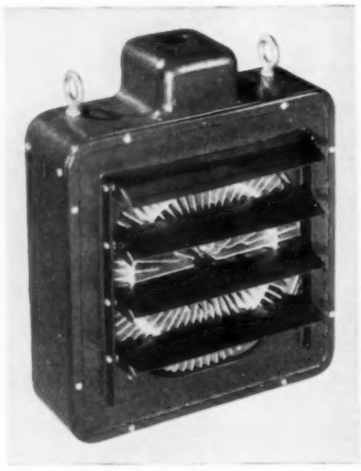
A new Electromode Industrial Heater (Model IBN) has been announced by the Electric Air Heater Co., Division of The American Foundry Equipment Co., 408 South Byrkit Street, Mishawaka, Indiana. Many completely new features are used in the design of this heater, such as the single, cast, circular grid; a cast aluminum fan housing, and a stronger housing construction.

The heat source in the new Electromode Industrial Heater is a cast aluminum grid, which has been poured around a calrod heating element. This grid construction, it is claimed, eliminates all hot wires and dead air space.

A motor driven, four-bladed aluminum fan, running on a graphite impregnated bronze bushing for quiet operation, it is stated, dissipates heat from the *entire* surface of the circular grid and circulates the warm air. Heat can be directed wherever it is needed by moving a series of adjustable deflectors mounted on the front of the unit.

The Electromode Industrial Heater is equipped with an "On" and "Off" switch and is provided with a thermal safety switch to prevent damage to the grid from overheating should the fan or air circulation stop for any reason. This unit is obtainable with thermostatic control which insures the maintenance of a constant temperature with never more than two degrees variation.

The heater may be suspended from the ceiling by means of eyebolts or fastened to the wall with angle braces.



Model IBN Electromode industrial heater

New Stain for the Parker Process

As one of the steps in the application of the Parkerizing process for the protection of iron and steel products from rust, staining is an important factor, first, because it contributes definitely to the rust resistance and also because it provides a deep, uniform black color that is highly desirable for certain iron and steel parts.

In line with the progressive improvement of Parkerizing methods as a whole, the research laboratory of the Parker Rust-Proof Co., Detroit, Michigan, is announcing a better staining material known as Parcolac No. 12, which assures a deeper, more permanent color on all surfaces, without mottling or streaking.

It is claimed that this new stain does not in any way change the fundamental characteristics of the Parker Process. With this finishing material production can be handled in bulk in baskets, or hung on racks, without accumulating contact marks. It requires only 30 to 60 seconds immersion in the solution.

The stain is applied to rinsed and dried Parkerized material in a steam heated tank of suitable size to handle the daily production. The only other equipment necessary is suitable baskets or racks, to be used for staining only. The basic material is furnished in the form of a dry, crystalline power, which dissolves readily in water. After the solution is once prepared, it is kept up to strength by small additions of the Parcolac No. 12 powder, when, in the opinion of the operator, the color is not sufficiently intense. After staining the production will usually dry of its own heat, when it is ready for the final coating of mineral oil, linseed oil, or wax.

Fig. 1. Appearance of Parker coating as it comes from the Parkerizing tank

Fig. 2. Appearance of Parker coating after staining with Parcolac No. 12

Parcolac No. 12 is said to provide a fast, low-cost system of producing a velvety, jet black color on Parkerized material by bulk production methods and to give the product greater sales appeal, as well as greater rust protection.

Rubber Linings

United States Rubber Products, Inc., 1790 Broadway, New York, announces that its Permobond corrosion proof protective linings are now available for practically every kind of service.

The features of Permobond linings are: (1) compounding the rubber to meet the specific problems of the job; (2) the permanent bonding of the lining to the walls of the tank; (3) the fact that Permobond linings are tailor-made and that no workman puts a hand to the job until U. S. Rubber engineers have planned it for design, facility of installation and specification of rubber. The result is a job especially engineered to fit individual requirements and, it is claimed, a permanent leak-proof lining and a bond that is practically an integral part of the metal surface itself.

There are many classes of chemicals which may be handled more satisfactorily with rubber than with any other lining substance. Steel or wood containers, lined with rubber, will stand up in contact with these chemicals for a very long time. Without this protective covering the steel or wood would be quickly destroyed in many cases. For instance rubber properly compounded is inert toward:

(1) All inorganic acids except strong oxidizing acids.
(2) Most organic acids.
(3) Inorganic salt solutions.
(4) Inorganic bases.
(5) Plating solutions.
(6) Hypochlorite solutions and chlorine water.

One of the most extensive uses to which Permobond linings have been put is in plating tanks. Many examples of savings as high as 35% in current costs are said to be on record. It saves floors from acid leakage, lowers operating and maintenance costs, and contributes materially to product uniformity. It may be used in tanks for full automatic, semi-automatic and batch plating.

Controllers

Foxboro Rotax controllers made by the Foxboro Co., Foxboro, Mass., utilize electricity as the operating medium and are designed to permit close control of temperatures under 1000° F., and of pressures up to 20,000 lbs. Contacts are of the brush and commutator type producing the sliding motion that is self-cleaning. There is absolutely no interference with the measuring system; the recording pen (or indicating pointer) being free to indicate the exact measurement at all times.

A wide variety of contact combinations enables the Rotax to meet quite involved circuit requirements. Standard controllers are available with as many as five commutators which will operate four signals or four control points. Special instruments

Foxboro Rotax temperature controller

can be built with even a greater number of contacts.

This it is stated, gives the Rotax the advantage of high and low signals, in addition to control, to warn against abnormal conditions such as low steam pressure, power failure, defect of a valve, breakdown of a pump or other accidents which would be beyond the power of the controller to correct.

Rotax Controllers are being successfully used on ovens and dryers, tempering baths, vats, metal pots, pickling tanks, plating baths and scores of other applications. They are available in a round case recording model and in round case and rectangular case indicating models.

Bulletin No. 184-1 on The Rotax is available to anyone requesting it.

Electricity has advantages for measuring temperature, air has advantages for automatic control and the Foxboro Stabilog Potentiometer combines both. The distinctly high level of sensitivity, precision and reliability of the potentiometer system of measuring temperature associated with the Stabilog System of air-operated control gives the metal worker a control instrument that is in a class by itself.

During 1936 a deviation recorder has been added to the Stabilog Potentiometer. This exclusive feature gives a record of control results, as well as of temperature deviation from the control setting, *without sacrificing control sensitivity*. Other features added this year are a double adjustment rheostat completely enclosed, manganin slide wires with

Foxboro Stabilog potentiometer pyrometer controller

platinum iridium contact, galvanometer with replaceable suspensions with hook-on clips, special gold alloy suspension strips of great tensile strength, cold junction compensating coil mounted on terminal board close to the actual cold junction, and a fine micrometer zero adjuster without backlash. Foxboro Bulletin No. 194-1 contains detailed information about this instrument.

Bonding Porcelain Enameled Architectural Panels to Masonry

An announcement of importance to manufacturers engaged in production of porcelain enameled panels for architectural purposes, is the new method known as Pemlox by which metal panels are securely bonded to masonry, cement, or by plastics. This development does not involve the sale of merchandise but is offered to industry by the Porcelain Enamel and Manufacturing Company of Baltimore, Maryland.

Heretofore the only method of attaching porcelain enamel sheets to masonry cement, concrete or plastic was with hooks or anchors.

Porcelain enamel for architectural use was given tremendous impetus at the Chicago World's Fair, and with the introduction of the Pem-lox method it is now possible to apply porcelain enameled panels to either the inside or outside walls of buildings, with all the solidity of a masonry wall, yet with all the beauty and cleanliness to be found only in porcelain enamel.

Pem-lox is a method of treating the reverse side of the metal panel, to produce cup-shaped depressions of irregular size, which bonds with cement or plastics. Pemlox can be applied in any porcelain enameling shop, with the regular spraying equipment.

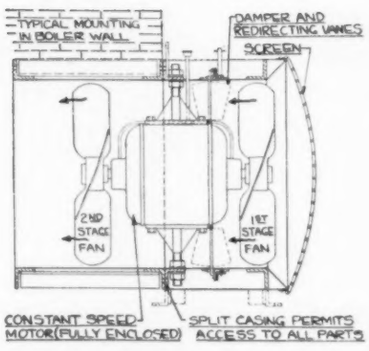
According to The Porcelain Enamel and Manufacturing Company, who developed and introduced the Pem-lox method, it is inexpensive and adapted to regular enameling plant practice. The Pem-lox method costs less than enameling the reverse side with ground coat enamel as is the usual practice.

Compound Motorized Blower Unit

A radically new design of blower has been developed by the L. J. Wing Mfg. Co., 154 W. 14th St., New York, known as their Type COM Blower.

By a 2-stage combination, the pressures (6" or 7" w.g.) and volumes required for forced draft and similar work are obtained at low, quiet, constant speeds, regulation of the air volume being secured by built-in control and redirecting vanes. The units are of simple construction, compact, efficient and have the driving motor self-contained. They are built for both horizontal and vertical mounting.

These units consist of a constant speed electric motor, with double extended shaft; two propeller type fan wheels, one mounted on each of the two extended shafts; an integral damper control and air re-directing mechanism built in between the two propeller fan wheels. The entire assembly is placed within a simple, rugged, cylindrical casing, arranged for ready accessibility.


TYPICAL MOUNTING IN BOILER WALL
DAMPER AND REDIRECTING VANES
SCREEN
2ND STAGE FAN
1ST STAGE FAN
CONSTANT SPEED MOTOR (FULLY ENCLOSED)
SPLIT CASING PERMITS ACCESS TO ALL PARTS

Wing Type COM blower

The integral damper mechanism permits precise control of the air delivery over a wide range with decreasing horsepower.

The control of dampers may be readily effected manually, or control can be obtained automatically by attachment to any of the standard automatic draft controls.

The entire unit is self-contained. The throw of a switch starts the blowers and all capacity regulation is obtained by merely adjusting the integral damper.

Flexible Shaft Grinder

The ½ H.P., heavy duty, flexible shaft grinder offered by Walker-Turner Co., Inc., Plainfield, New Jersey, uses a minimum of floor space yet, it is claimed, will do innumerable jobs. A special telescopic column permits the shaft to be raised 15". The

Walker-Turner ½ h.p. flexible shaft grinder

normal height is 42" while the full height is 57". The flexible shaft is 5' 4½" long, rubber covered, with an SKF ball bearing hand piece. The motor swivels but may be locked in any position. The deep base acts as a tool tray. SKF ball bearings are used throughout this inexpensive machine.

Finishing Varnish

A finishing varnish for use over white and colored coated jobs is a new product of the North Bergen Varnish Corporation, 989-1005—39th St., North Bergen, N. J. This finish called the Berco Vitrite Finishing Varnish is intended for decoration as well as protection. It dries to a smooth, hard glossy finish with paleness as its outstanding feature.

Berco Vitrite is ready for fabrication within 24 hours after application and will stand up, it is stated, under the operations applied in canning manufacture. It is very high in solvents, allowing a reduction of as much as 20 per cent. The usual reduction is about 4 gallons of varnish to 3 quarts of ordinary thinner, resulting in a varnish with a good gloss.

On work where white coatings or delicate pastel colors predominate, Vitrite is usually

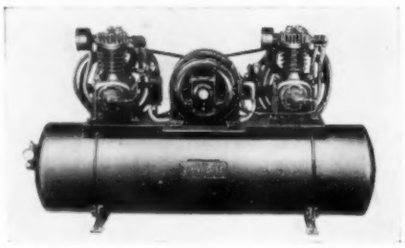
applied to a thickness of 9 mm. (Pfund film gauge) and baked for 17 minutes at 215° F., or for 11 minutes at 235° F. on deep colors. It is usually applied to a thickness of 9 mm. and baked for 11 minutes at 235° F.

Air Compressors

The DeVilbiss Company has announced four new air compressing outfits available in 7½ or 10 horsepower with single or two stage compressors available with either horsepower. The new compressing outfits are designed especially for auto refinishing establishments, whose compressed air requirements are unusually heavy, and for small industrial plants whose compressed air needs are beyond the capacity of the ordinary air cooled compressor but not equal to the capacity of the industrial type water cooled air compressing outfit.

Two compressors, each developing a maximum pressure of 200 pounds with the two stage compressors or 150 pounds with the single stage, are firmly mounted on opposite ends of the 20″ x 60″ air tank. The motor driving both compressors is set between them on the air tank.

Each compressor has a "V" belt drive, combination air strainer and muffler, check valve, inter and after cooler, and centrifugal pressure release mechanism set to cut in at 160 pounds and cut out at 200 pounds on the two stage, and in at 80 pounds and out at 100 pounds on single stage compressor. Displacement of outfits varies from 31½ to 57 cubic feet of free air per minute, depending upon pressure and horsepower.



DeVilbiss compressor

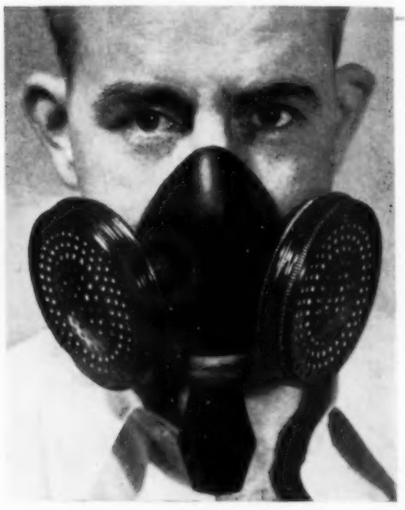
Air tank capacity of both 7½ and 10 H.P. outfits is 10.88 cubic feet, although a 20″ x 72″ tank with an air capacity of 13.06 cubic feet is available at a slight additional charge.

Standard equipment on all outfits includes pressure gauge, outlet, drain and safety valves, and automatic starting device.

Respirators

Designed for comfort and safety, the new M.S.A. Comfo-Respirators is said to offer highly efficient respiratory protective equipment, designed so that workmen can and will wear it without the inconvenience of high breathing resistance and excessive weight.

The M.S.A. Comfo-Respirator features twin-side placed filters with an unusually large filtering area. The filtering medium consists of a cellulose filter and a felt screen.



MSA Comfo-Respirator

Filtering efficiency is accomplished through the use of scientifically treated filter discs of a special cellulose material which is designed to protect the wearer against particles down to a fraction of a micron in size (a micron being 1/25,000 of an inch).

The position of the filters, as well as the head straps, assures non-interference with vision and working freedom, and allows the wearing of spectacles, goggles, welding helmets or head coverings of any kind. The soft, flexible, inturned edge of the facepiece assures a comfortable fit and air-tight seal.

M.S.A. Comfo-Respirators are available in two models. One, known as the Dust and Mist Respirator (U. S. Bureau of Mines Approval No. 2101 AC), is designed to safeguard workmen against pneumoconiosis-producing or nuisance dusts, whether dry or supported in a water mist. In addition to silica, coal, iron, asbestos and other dust particles of similar type, the respirator will protect the wearer against inhalation of the mist produced in chromium plating, and the mist produced in spraying operations with vitreous enamels whose liquid vehicle does not release harmful gases or vapors. The other, the Comfo-Lead Dust Respirator (U. S. Bureau of Mines Approval No. 2107), developed more recently, provides protection against the inhalation of mechanically-generated lead dust. The essential details of both units are covered by the U. S. Patents issued by the manufacturer, Mine Safety Appliances Company, Braddock, Thomas and Meade Avenues, Pittsburgh, Penna.

Protecting Fine Metal Finishes

A new method for the protection of plated finishes has been developed and patented. It is known as the Temprokote Method, sponsored by Collord, Inc., 1430 Rosedale Court, Detroit, Michigan. It is recommended as a practical way to protect products during the process of manufacture, in transit or storage.

Temprokote, meaning temporary protective coating, is the application, by spraying or by roll-coat application, of a special adhesive to suitable paper which is immediately applied to the metal. The adhesive quickly dries in position, retaining the paper firmly to the metal. The paper may be stripped from the metal at any time, taking the adhesive away with it. The metal surface, it is stated, is kept in the same clean, unblemished finish as when it left the factory.

Collord, Inc., also have developed a rubber in liquid form that can be sprayed or dipped. This rubber film dries to a firm, tough finish, safety bonded to the metal. It can be peeled from the metal after it reaches the dealer or final owner. The product thus is completely protected against scratches dust or grit. This is recommended for protection of irregularly shaped objects.

Automatic Gluepot

Quick production of workable glue and careful regulation of glue temperature are the outstanding advantages of a new automatic gluepot announced by General Electric. It is designed to heat rapidly until it reaches 140-150 degrees F.—the temperature required for best results. This final temperature is factory set and is accurately and automatically maintained.

G. E. Automatic glue pot

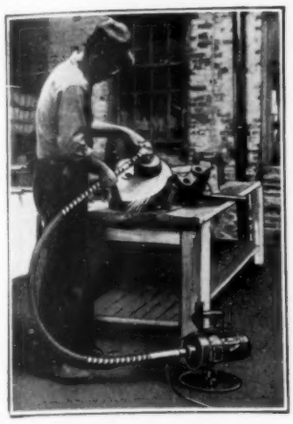
The gluepot consists of a removable copper container for holding the glue, a heated copper jacket in contact with the glue container, and an outer protective casing of heavy steel. It has a capacity of two quarts and is available in 115- or 230-volts, a-c or d-c.

Universal Grinder

The Mall Tool Company, Chicago, Illinois, announces the introduction of a new type of flexible shaft grinder—the 1½ H.P. Universal.

This grinder operates at 9000 r.p.m. on either 110 volt A.C. and D.C. or 220 volt A.C. and D.C. currents. It delivers high

speeds together with high horsepower to the working tool. With this high speed grinder, it is claimed that a 4″ wheel will



Mall 1½ h.p. Universal grinder

accomplish the same results as an 8″ wheel used on a slow speed unit.

The Universal grinder is recommended for grinding weld seams, flat surfaces, surfacing and snagging castings, grinding stainless steel, and numerous other grinding jobs in all industrial plants.

Portable Pyrometer

A new millivoltmeter-type portable indicating pyrometer is now being offered by The Bristol Company, Waterbury, Conn., for measuring temperatures up to 3000° F., using a thermocouple and extension leads.

Use of a cobalt magnet is said to allow exceptional design features—including increased sensitivity and a widened scale for

Bristol portable pyrometer

more accurate readings. Unusual sensitivity is accomplished without the need for critical leveling adjustments and with no sacrifice of ruggedness. The high-resistance millivoltmeter movement is double-pivoted and completely shielded to prevent the effects of stray fields.

The molded Bakelite case is of moisture- and dust-proof construction, and of modern design. The instrument is available in single and in double ranges. It is especially adapted for industrial use.

Measuring Thickness of Nickel Coatings

The local thickness of an electroplated nickel coating on a non-magnetic base metal may be measured by a new instrument announced by the American Instrument Co., Silver Spring, Md. The principle of the method involves the measurement of the force required to detach one pole of a permanent magnet from the nickel coating, and the comparison of this force with that required to detach the same magnet from a similar nickel coating of known thickness.

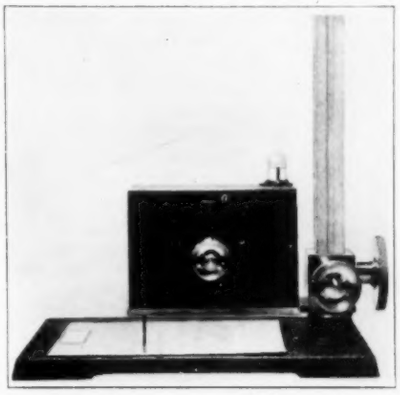
The instrument is calibrated with nickel coatings of known thickness which have been deposited under about the same conditions as the coatings to be tested. Nickel coatings deposited under different conditions have somewhat different magnetic permeabilities, but if such coatings are annealed at 400° C. (750° F.) they acquire about the same permeability; therefore the magnetic method is more reliable for annealed coatings than for coatings as deposited.

Measurements on coatings as deposited are correct within ±15%, and on annealed coatings within ±10%.

The magnetic method is rapid and non-destructive, and for thin coatings its accuracy approaches that of metallographic measurements.

The metallographic method (in which the thickness of coatings is measured by means of a microscope and scale) requires experience and expensive equipment, and results in destruction of the specimen tested.

The sensitivity of this instrument can be varied by the proper selection of the spring, each division on the dial corresponding to approximately 0.00025 mm. (0.00001 in.) of nickel, so that the 100 divisions cover the range of thickness usually applied to non-ferrous metals. The reproducibility is about



Instrument for measuring thickness of nickel coatings

3% on coatings down to about 0.0005 mm. (0.00002 in.).

The new instrument is equally applicable to plane, convex and concave surfaces. The presence of the usual thin chromium coatings over the nickel has no appreciable effect on the thickness measurements, and is advantageous because it prevents oxidation of the nickel during annealing.

The new instrument is compact and light in weight—measures, 5 x 9 x 9 in. high, and weighs only 7½ lb. without its carrying case.

De-Watering Tank

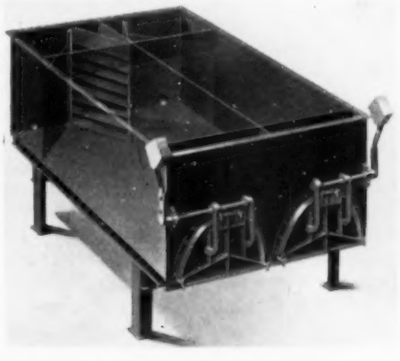
The new Schneible rectangular tank multi-louver dewaterer is made for use in smaller systems of Multi-Wash Dust Collectors where the quantity of water and sludge produced does not justify the use of the larger capacity truck type dewatering tank, or the still larger concrete rectangular tanks.

As its name implies, this unit is rectangular in shape and made for setting directly on the floor or on steel legs as conditions require. The tank is made with a divider down the center separating it into twin tanks for alternate use. At one end is the sludge and water inlet distributor trough just inside and above the sludge discharge gates. At the opposite end are located the weir, skimmer walls, the multi-louvers, and the recirculating and dewatering outlets.

Sludge and water from the multi-wash collector is piped to the dewatering tank and enters at the closed end through the inlet distributor trough which directs it into one of the sections of the tank.

After complete settling, the valve on the line leading to the interior of the loaded tank is opened and the head of water in the tank is allowed to recede slowly. The water flows out of the precipitated material and, it is stated, does not carry the material with it due to the angle of repose of the silica sludge against the multi-louver vanes; also that the final draining period reduces the moisture contained in the sludge down to approximately 20% or lower.

Then the sludge in the dewatered tank is



Schneible dewatering tank

completely drained, the discharge gates are opened and the sludge is pushed out into a convenient receptacle for disposal.

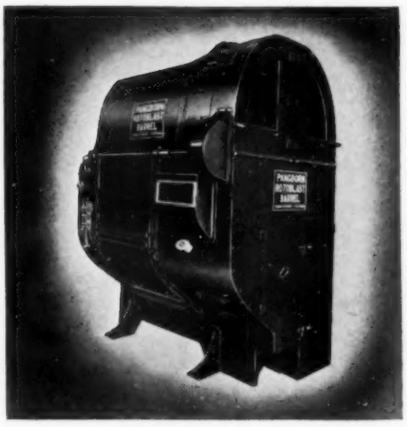
Descriptive literature is available from the Claude B. Schneible Company, 3951 Lawrence Avenue, Chicago, Ill.

Airless Blast Cleaner

A new Rotoblast "Rocker" barrel is the latest step forward in Pangborn airless blast cleaning equipment made by the Pangborn Corporation, Hagerstown, Md. It is a typical general purpose blast barrel designed for all types of blast cleaning including flat, mixed, long and fragile work as well as the usual sizes and types of castings, forgings, heat treated parts, etc.

Among the advantages claimed are extra rapid cleaning action effected by the abrasive being free from dust and fines at all time because of the special abrasiving cleaning system; the folding conveyor drum which gives a rocker-like action to the work being cleaned causing both large and small pieces in the load to come to the top where they are all cleaned evenly.

The Rotoblast barrel is made in two standard sizes 6 x 12 cu. ft. capacity.

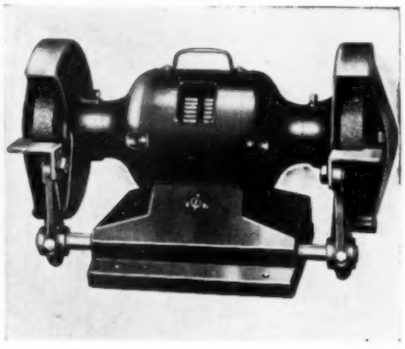


Pangborn Rotoblast barrel

Heavy Duty Grinder

The Diehl Manufacturing Co. (Electrical Division of The Singer Mfg. Co.), Elizabethport, N. J., has placed on the market a new heavy duty grinder for general grinding and polishing operations. A substantial cast iron base is arranged for fastening the grinder firmly to the bench or table. Portability is provided by means of a handle secured to the motor yoke. Adjustable steel tool rests may be set in any grinding position to compensate for wheel wear. Heavy steel wheel guards afford protection to the operator, completely enclosing the wheel except for the working sector. These guards are adjustable to permit the use of the entire circumference of wheels.

The grinder is furnished with two wheels, 7″ x 1″, one coarse grain and the other fine. It is powered by a ½ horsepower, 3450 R.P.M. for 110 volt, 60 cycle, single phase alternating current operation. Motors for other currents can be supplied as well as special attachments such as a pedestal for floor mounting, wire wheels or buffing wheels, extra grinding wheels, shutter-proof glass eye shields, etc.



Diehl heavy duty grinder

Color Effects on Wrinkle Finishes

Sherwin-Williams Co., 292 Madison Ave., New York, has recently devised a system to apply almost any conceivable color on surfaces or products having a wrinkle-texture finish. The new method enables the finisher and marketer to benefit by making available products decorated in colors best suited to particular requirements. Today, the search for new and attractive merchandise is keener than ever. Consequently the finisher, no less than the merchant, must use every facility at his command to grasp the opportunity for increased sales by supplying attractive products in color to the public.

The system involves the application of art metal platinum gray or black in the regular way and baking for at least one hour at 250 degrees F. Then recoat with lacquer or high gloss enamel in the color desired, applying only sufficient material to get a solid covering.

Caution. Care must be taken to avoid applying a too-heavy coat of lacquer enamel which might tend to fill up the desired irregularities of the original art metal coat.

This new method it is claimed, permits the use of combination lacquer-synthetic enamels or high gloss enamel colors over a wrinkle finish, thus making possible such advantages as:

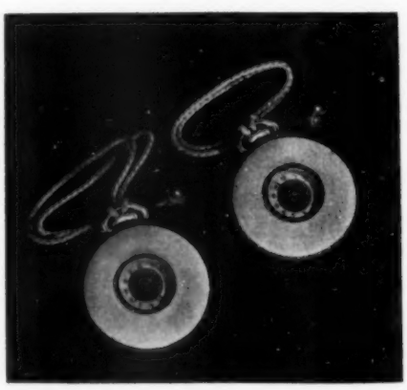
1. Widest possible color range without the need for special batches of art metal finishes.

2. Permits finishers to take care of their requirements with smaller stocks of art metal finishes.

3. Makes possible changing the color of a finished article by merely re-spraying with Opex; also simplifies finishing in two-tone effects.

4. Brighter, cleaner colors are obtained by this method because the lacquers are not baked and therefore the possibility of discoloration due to irregularity in oven temperatures is eliminated. Thus, the percentage of pieces which need refinishing, in production, is greatly reduced.

5. The new system is strongly recommended where pieces are to be finished in other colors in addition to the original color of the art metal finish, because, it is stated, there is practically no difference between the gloss of the lacquered and unlacquered finish.



Modern modes require novel finishes

Flexible Shaft Grinder

A new grinder known as the 3524-DP has been recently introduced by the Mall Tool Company, 7756 South Chicago Avenue, Chicago, Ill. This grinder has a ½ H.P., 3450 r.p.m. ball bearing mounted constant speed motor, a 7/16″ diameter by 6 foot flexible shaft which rotates within an internal bearing flexible housing. The angle and straight spindles have large bearings for ease of operation and long life.

The mounting has large easy rolling

Mall 3524-DP grinder

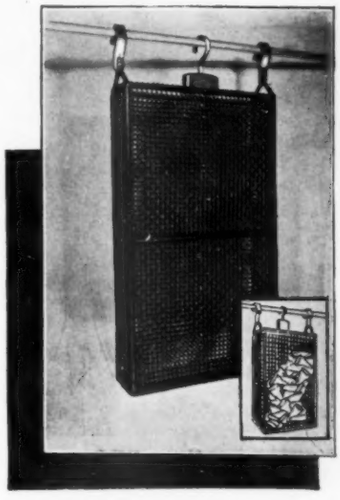
casters. A tool tray is provided for tools and miscellaneous attachments.

Like other Mall units, this grinder can be fitted with attachments for disc sanding, grinding, buffing, polishing, drilling and many other applications.

Scrap Anode Basket

Electroplaters who have been used to selling their scrap anodes as junk, will be interested in a new scrap anode basket manufactured by the Belke Mfg. Company, 947 N. Cicero Ave., Chicago, Ill., which it is stated makes this practice unnecessary.

By suspending a new anode in the center of this basket, it is possible to use up all short pieces of anodes in productive plating. The basket consists of steel wire mesh which is insulated with a heavy coating of Belke hard rubber. According to the manufacturers, all that is necessary is to hang this basket on the cathode bar, suspend one new anode in the center and dump all of the small pieces into the basket. Contact is obtained from the full size anode in the center.



Belke scrap anode basket

Belke dipping basket

Filter bags are also provided which prevent sludge or small pieces from contaminating the solution. The scrap anode basket can be made suitable for any size plating tank.

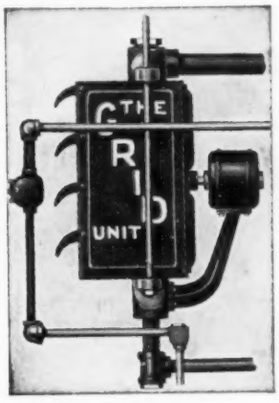
Rubber Covered Dipping Baskets

The Belke company also manufactures a line of hard rubber covered dipping baskets. These baskets are covered by the same process as the Belke hard rubber insulating plating racks. The rubber coating is said to be impervious to boiling cleaners, caustics and alkaline solutions. Another advantage claimed is the improvement in handling highly polished work which is not scratched by the rubber.

Humidifier for Heaters

A humidifier to be attached either in front of a unit heater or directly behind the unit is announced by The Unit Heater & Cooler Co., Wausau, Wisconsin. Illustrated here, it is known as "Grid" Humidifier. To install it no air lines or extra piping are necessary. The medium for humidifying purposes is immediately at hand in the unit heater. The operation of the humidifier is at temperatures higher than the room atmosphere, which causes quick and instantaneous absorption of the humidifying fluid or gas.

The "Grid" Humidifier may be operated with the unit heater or as an individual unit, and even though the fan on the unit heater is shut down, the humidifying action of the device continues to function until such time as desired conditions are reached in the room, when the controls on the humidifier will shut it down. Installation of the "Grid" Humidifier with unit heaters makes possible their use in all kinds of manufacturing that requires variation in humidity conditions due to special processes or manufacturing conditions.



Grid humidifier

pH Papers

The Lea Mfg. Co., Waterbury, Conn. has placed upon the market a new method for the determination of pH by the use of pH papers, which permits visual quantitative determination of the acid or alkaline content of solutions. They are as fast as the well-known Litmus papers and, it is stated, give accurate quantitative results at a glance. Several ranges, as follows, are available:

1	5.2 to 6.7
2	3.6 to 5.0
3	3.7 to 5.3
4	1.2 to 3.4
5	0.9 to 1.5
6	9.5 to 11.0
7	11.0 to 13.5

These papers are very handy not only in the laboratory but out in the plant where control of acidity or alkalinity in production must be maintained.

Watch for the August
Metal Industry!

The August METAL INDUSTRY will contain several features, the high spots of which will be the following:

Exhibits of Members' Work, Equipment and Supplies; held in connection with the Silver Jubilee Convention of the A. E. S.

Purchasing Procedure for Metal Manufacturing Plants, by Charles W. Hardy, Industrial Consultant, New York.

Chemical Burns—Their Nature and Treatment.

Modern Machinery and Craftsmenship in the Manufacture of Sterling Silverware, by R. H. Abbe, Superintendent, Towle Mfg. Company, Newburyport, Mass.

Watch for the August
Metal Industry!

What the Reader Says

Beautiful Jacket and Typography

A copy of the May issue of the METAL INDUSTRY has just reached me, and the beautiful jacket and typography are indeed wonderful.

Besides the typographical excellence of this paper, the reading matter of this issue cannot fail to be interesting and informative both to platers and to anyone having an interest in the plating line.

It is quite obvious that as years pass this issue will be greatly enhanced in value and will take its place along with text books on plating.

Wishing you continued success, I am,
New York LEWIS ROE.

The Best Article on Polishing

Mr. Joseph Sexton
Dear Joe:

I have just read your article in the April issue of METAL INDUSTRY and believe me when I say it is one of the best articles I have read in a long, long time.

Your article is one of the very few that has been published during the past ten years that gives definite information. You have told the type of barrel to use, the kind of material to use in the barrel, the speed of the barrel and on polishing and buffing you have given the grain sizes and the speed of the wheel, etc. These are concrete facts and not just a lot of bunkum like most of the articles published where they are very indefinite and give you nothing in detail.

Joe if you do not believe my statements I challenge you to show me another article published during the past ten years that gives as much detailed and definite information in as concise a form as you have put it.

Congratulations Joe, and give us some more. These are the kind of articles we want in our files for future reference.
Waterbury, Conn. R. S. LEATHER.

Must Join the Caravan

I, too, must join the caravan in complimenting your Organization on the improved issue of METAL INDUSTRY. The covers are but a faint indication of what transformation has taken place inside of same. There is no doubt but what the reading matter is more legible, the general get-up of the magazine more attractive, and it certainly deserves a compliment.

The only fly in the ointment is that many who should read it do not, and the question is how to get them to do so. I always utilize an opportunity, when I can, of advocating the reading of all business literature, especially the trade papers.

FREDERICK J. LANDOLT.
Brooklyn, N. Y.

New Books

Symposium on Radiography and X-Ray Diffraction Methods. Published by the American Society for Testing Materials. Size 6 x 8½, 350 pages. Price $4.00.

The twelve extensive technical papers and large amount of discussion comprising the Symposium on Radiography and X-ray Diffraction Methods were prepared by outstanding authorities in the field. Six of the papers deal with radiography, covering principles, foundry applications, radiography in the welding shop, miscellaneous applications of radiography and fluoroscopy, radiographic specifications, and gamma-ray radiography and its relation to X-ray radiography. An appendix to this latter paper provides instructions for radiography with radium. Authors of the papers in this section include: JOHN T. NORTON, EARNSHAW COOK, J. C. HODGE, HERMAN E. SEEMAN, H. H. LESTER and NORMAN L. MOCHEL.

The six papers devoted to diffraction cover equipment and methods, constitution of alloys, chemical analysis, determination of particle size, applications to non-metallic materials, and to problems of cold work, preferred orientations, and recrystallization. Authors in this section include: CHARLES S. BARRETT, KENT R. VAN HORN, WHEELER P. DAVEY, JOHN T. NORTON, G. HARVEY CAMERON, and GEORGE L. CLARK.

How to Weld 29 Metals, by CHARLES H. JENNINGS. Published by Westinghouse Electric and Mfg. Co., E. Pittsburgh, Pa. Size 5¼ x 8¼, 100 pages. Price 50 cents.

Specific data for welding all types of joints with varying thicknesses of metal such as electrode diameter, welding current, speeds, deposition, etc., are included.

This work includes definitions, outlines of distribution procedure, enumerates catalog uses and also a questionnaire from which those who wish to obtain information from their customers and prospects for use in determining their own catalog procedure.

The basic fundamentals regarding catalogs and a great deal of the available data on the subject reduced to simple words.

Legal Tax Saving Methods, prepared by HUGO E. ROGERS, HERMAN H. COHEN and LEO M. CHERNE. Published by the Tax Research Institute of America, Inc., 20 W. 43rd St., New York.

A loose-leaf volume for keeping up-to-date information on tax methods and proper procedure in meeting the law.

An important section is entitled "Tax Saving Methods," which includes 150 specific ways of reducing or eliminating Federal taxes.

Practical Handbook on Electroplating, published by W. Canning & Co. Ltd., London, England. Size 6 x 9, 359 pages. Price $2.50.

The 13th (1937) edition of this useful book of practical information on electroplating, polishing, bronzing, lacquering and enameling. It is published by the manufacturer of equipment and supplies, but it is a technical work, written in simple language for the practical man's convenience, at the same time serving as a catalog for the products of the Canning company.

The main subjects covered are: grinding and polishing; electroplating; cleaning; processes of electrodeposition; bronzing; lacquering and enameling.

Metallic Corrosion Passivity and Protection, by U. R. EVANS. Published by Edward Arnold & Co. Size 6 x 9, 720 pages. Price $15.

This is a monumental work dealing with the scientific aspects of corrosion by an international authority on the subject. The book is large and for that reason only a brief review can be published at this time. At a later date, we hope to publish a more extended and detailed review.

The division of this large subject is interesting. Each chapter is divided into three sections: (a) the scientific basis; (b) practical problems; (c) qualitative treatment. The chapter headings include the following: Simple Examples of Corrosion and Passivity; Thin Films; Oxidation at High Temperatures; Atmospheric Corrosion and Tarnishing at Ordinary Temperatures; Corrosion by Stagnant Liquids; Corrosion by Moving Liquids; Hydrogen Evolution; Influence of Constituents of the Liquid; Influence of the Major Constituents of the Metallic Phase; Influence of Stress and Strain; Influence of Contacts and Crevices; Protection by Metallic Coatings; Protection by Paints and Enamels; Testing; The Optical Measurement of Film-Thickness.

Technical Publications

"Tests for Acid Resistance of Porcelain Enamels." Published by PORCELAIN ENAMEL INSTITUTE, 612 N. Michigan Ave., Chicago, Ill., prepared under the direction of the Institute's committee on test standardization of which W. N. HARRISON of the NATIONAL BUREAU OF STANDARDS, is chairman. The test, which has been in the course of preparation for over a year, is termed a "Tentative Standard" and will continue in its present form until it is supplanted by a standard test for acid resistance.

The Use of Tin in Refrigerating Equipment, by E. J. DANIELS and D. J. MACNAUGHTAN. No. 3 of a series of technical publications of the International Tin Research and Development Council, 149 Broadway, New York City.

Preparation of Iron Oxide as a Source of High-Purity Iron, by HAROLD E. CLEAVES and JOHN G. THOMPSON. Research Paper RP996. National Bureau of Standards, Washington, D. C.

Government Publications

U. S. Imports of Metals and Manufactures Tabulated, by MAURICE JUDD. Information Service, Works Progress Administration, Washington, D. C.

Metallic Cartridges; Simplified Practice Recommendation R62-37. National Bureau of Standards. For sale by the Superintendent of Documents, Washington, D. C. Price 5 cents.

Lead Industry in 1936. Advance Summary. U. S. Bureau of Mines, Washington, D. C.

Non-Ferrous Metals; Census of Manufactures, 1935. Bureau of the Census, Department of Commerce, Washington, D. C.

Platinum and Allied Metals in 1936. Advance Summary. U. S. Bureau of Mines, Washington, D. C.

Copper Industry in 1936—Advance Summary. U. S. Bureau of Mines, Washington, D. C.

Standard Samples Issued or in Preparation by the National Bureau of Standards. National Bureau of Standards, Washington, D. C.

Associations and Societies

American Foundrymen's Association

222 W. ADAMS ST., CHICAGO, ILL.

The American Foundrymen's Association, in cooperation with certain of its Chapters and various universities, has scheduled three regional meetings and one mid-year technical meeting for the Fall season.

The first of the four meetings will be the mid-year technical sessions to be held at Columbus, Ohio, through the joint cooperation of the BATTELLE MEMORIAL INSTITUTE and A.F.A. September 30 and October 1 are the dates decided upon for the meeting which will be devoted exclusively to a thorough discussion of a few outstanding technical problems relating to steel, non-ferrous and gray iron foundries. Conference leaders will be chosen from the foremost foundry technologists. Those attending will have the opportunity to inspect the Institute's new foundry research laboratory, a building given over entirely to the study of foundry metals and processes. DR. C. H. LORIG and C. E. SIMS, of the Institute staff, are in charge of the program for the meeting.

According to tentative plans CLYDE WILLIAMS, director of the Institute, will give the address of welcome and sessions will be held on non-ferrous alloys with DR. H. W. GILLETT as chairman and DR. BRUCE GONSER discussing the effects of chromium on copper alloys. The cast iron sessions will deal with structures of cast iron with a notable array of speakers. The steel castings session will discuss alloy steels and the effect of aluminum on cast steel.

The first regional conference of the year will be held at MISSOURI SCHOOL OF MINES, Rolla, Mo., under the joint auspices of A.F.A., St. Louis District Chapter of A.F.A. and the University. Dates set for the meeting are October 8 and 9 and a tentative program, as drawn up by the St. Louis District Chapter committee, includes sessions on sands, refractories, metallography, non-ferrous castings, gray and alloy irons. A dinner and luncheon also are scheduled. H. BORNSTEIN, Deere & Co., Moline, Ill., president-elect of A.F.A., is scheduled as the dinner speaker. A notable array of talent, both local and national, also has been secured for this meeting. Full details of the program will be given later.

Another regional meeting is proposed for CORNELL UNIVERSITY, Ithaca, N. Y., to be held under the joint auspices of A.F.A., the Buffalo Chapter and the University. This meeting probably will be held the latter part of November. At present, the university is working on a tentative program.

A Second Annual Iowa Conference also will be held in conjunction with the Quad City Chapter and one of the state universities. As yet no date has been set and details will be available later.

Metropolitan Brass Foundry Association

CARE OF JOHN L. CARTER, 83 POLK ST., NEWARK, N. J.

The Metropolitan Brass Foundry Association held a regular monthly meeting on Thursday, June 10th, at 2 Park Ave., New York. At this meeting new officers were elected for the coming year as follows:

President—Wm. E. Paulson, Thomas Paulson & Son, 450 Union St., Brooklyn, N. Y.

Vice-President—W. M. Staubus, International Aluminum Foundry, Inc., 414 E. 23 St., New York.

Secretary—John L. Carter, 83 Polk St., Newark, N. J.

Treasurer—Frederick H. Landolt, Penn Brass & Bronze Works, 111 Dobbin St., Brooklyn, N. Y.

Directors—P. J. Halloran, P. J. Halloran's Brass Foundry, 21-10 Broadway, Astoria, L. I. R. Kussat, Atlas Foundry Co., 282 Meserole St., Brooklyn, N. Y.

The Association invites the brass founders throughout New York to join its ranks. Non-member brass foundrymen are welcome as guests.

National Metal Congress

HEADQUARTERS 7016 EUCLID AVE., CLEVELAND, OHIO.

Ninety-one per cent of the exhibit space at the 19th Annual National Metal Show, to be held October 18-22 in the Atlantic City Auditorium has already been contracted for by 189 industrial companies.

The Auditorium in which the exhibits will be held on one floor has 154,348 sq. ft. unencumbered by pillars or posts.

The Congress is sponsored by five national technical societies: AMERICAN SOCIETY FOR METALS; AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS; (INSTITUTE OF METALS DIVISION AND IRON AND STEEL DIVISION); AMERICAN WELDING SOCIETY; SOCIETY OF MECHANICAL ENGINEERS; THE WIRE ASSOCIATION.

Personals

Austin B. Wilson

Austin B. Wilson, the new president of the American Electro-Platers' Society was born in 1895. He graduated from the Buffalo Lafayette High School in 1913 and started on his industrial career in the laboratory of the American Brass Co., Buffalo, N. Y., in the same year. In 1915 he was employed by the Titanium Alloy Mfg. Company, Niagara Falls, N. Y., in their physical laboratory, and remained there until 1923. For the last four years of this period, he had charge of their physical and metallographic laboratories. From 1923 to 1925 Mr. Wilson worked with the Trumbull Steel Co. as a metallographist and on plant experimental work.

From 1925 to 1934 Mr. Wilson was metallurgist of the Flint plant of the Chevrolet Motor Company and from 1934 to date he has been metallurgist for the Detroit plants of the Chevrolet company.

Mr. Wilson first became interested in plating in 1926. He has installed and operated most of company's plating jobs, the generator capacity of which is about 300,000 amperes. In connection with this work he installed and put into operation the first full automatic plating machine for depositing chromium on piston pins, at their Bay City plant.

Mr. Wilson has been one of the most active members in the A.E.S. in the Detroit district.

AUSTIN B. WILSON

President, American Electro-Platers' Society

John C. Campbell

John C. Campbell, president of the Newark Wire Cloth Company, Newark, N. J., completed his 60th consecutive year as a manufacturer of wire cloth on April 2nd, 1937. Approximately 26 of those 60 years have been with his present company.

Mr. Campbell was born in Newark, April 4, 1860. He started work in the Stephens Mills later known as the DeWitt Wire Cloth Company in Belleville, and worked for them

JOHN C. CAMPBELL

for many years. An opportunity came for him to buy three antiquated hand looms for weaving wire cloth which he took, and went into wire cloth manufacturing business. The company grew steadily in spite of intervening lean periods of depression between periods of prosperity. In 1923 they purchased the Morse and Whyte Company of Cambridge, Mass.

The company now is one of the largest of its kind. The plant includes several buildings, the main building being 310′ x 100′ in size.

Mr. Campbell has always taken a lively interest in politics and civic affairs. His son Leggett C. Campbell is secretary-treasurer of the company. Another son, A. A. Campbell is an architect, engineer and builder and erected the main building of the Newark Wire Cloth Company.

GEORGE MAILY has become associated with SACK, INC., Cambridge, Mass., manufacturer of furniture trimmings, as foundry organizer and superintendent. Previously MR. MAILY was connected with the KEELER BRASS CO., Grand Rapids, Mich., for 2 years and with the GORHAM MFG. CO., Providence, R. I., for 3 years.

MARTIN RIEGER JR., has recently joined the New York office of the FOXBORO CO., Foxboro, Mass., as a specialist in the pyrometer division of the company. MR. RIEGER is an electrical instrument engineer formerly connected with the WESTON ELECTRICAL INSTRUMENT CORP.

Obituaries

L. Burton Hall

L. Burton Hall, vice-president of the International Silver Co., Meriden, Conn., with which, and its predecessor companies, he has been associated for fifty-six years, died recently in his apartment in the Hotel Grenada, Brooklyn, at the age of 79.

A native of Meriden, Conn., Mr. Hall entered the silver business there with the Wilcox Silver Plate Co., of which his father, the late Lewis Hall, was a part owner. For the last forty years, Mr. Hall had made his headquarters at 13 Maiden Lane. He was a trustee and a deacon of the Emanuel Baptist Church in Brooklyn. He is survived by his second wife, the former Mrs. Julia Montgomery, and a son of his first marriage, Lewis B. Hall, Jr., 7 W. 81st St., a member of the New York Stock Exchange, firm of Dobbs & Co., 1 William Street.

Joseph Shoemaker

Joseph Shoemaker, formerly a Jackson, Mich. manufacturer, died at Mercy Hospital in that City, on Friday, June 4. He was 42 years old. For several years he was president of the National Enamel & Chromium Plating Co., in Jackson.—F. J. H.

Frank L. Uhl

FRANK L. UHL, president of the Detroit Brass and Malleable Works, died at his home, 8400 LaSalle boulevard on Thursday, June 10, following a heart attack the previous day. He had been an executive in his company for more than 20 years, and for 10 years was its president. He leaves his wife, a daughter, and two sons. The funeral was on Monday, June 14.—F. J. H.

News from Field Correspondents

Waterbury, Conn.

June 18, 1937.

Another pay increase amounting to 5 cents an hour for the hourly workers and corresponding increases for the piece workers was announced this month by the AMERICAN BRASS CO., SCOVILL MFG. CO. and CHASE BRASS & COPPER CO. This is the fifth wage increase of approximately this size during the past year.

In May 37,672 persons were employed in local concerns employing 65 or more, a decrease of 210 as compared with April, the first decrease in employment for over a year. However, the present figure is 5,770 more than in May last year. Employment in the eight largest factories was 21,294, a decrease of 17 compared to the past month but an increase of 4,298 over the same month last year.

Most of the WATERBURY CLOCK CO.'s 3,000 employees walked out on a brief strike June 14 when it was announced that the plant would close from June 30 to July 6 without pay. A committee of the strikers demanded vacation with pay. After a conference with President JAMES R. SHELDON and other officials of the company, it was announced that the plant would be closed from July 2 to July 11 and the company would give the employees one-half a week's pay on July 14 and another extra half-week's pay just before Christmas. While there was some opposition on the part of the employees most of them accepted these terms and returned to work after several hours.

On May 22 a strike at the same plant was averted when the workers demanded a 10 per cent pay increase but were promised an increase of 5 per cent by July 1.

More than 500 employees of the WATERBURY BUCKLE CO. and 200 employees of the NOERA MFG. CO. have been out on a strike for nearly a month. They are members of the WATERBURY BRASS WORKERS' UNION, a C. I. O. affiliate. The WATERBURY BUCKLE employees demanded reinstatement of a C. I. O. member who, they said, was discharged for union activity, and establishment of minimum wages. The NOERA CO. employees demanded a 40 hour week and time and one-half for overtime.

Officials of the WATERBURY BRASS WORKERS' union have been holding numerous conferences during the past month with JOHN H. GOSS, vice president of the SCOVILL MFG. CO. While both sides refuse to disclose the subject of the conference it is understood it has to do both with recognition of the Union as the bargaining representative of the workers and abolition of work on Sunday in the tube mill.

The SCOVILL MFG. CO. has declared a dividend of 50 cents a share, payable July 1 on stock of record June 15. This is twice the usual quarterly dividend of the past several years.

The last of the machinery of the former STEELE & JOHNSON plant on South Main Street was moved last month to the MACHINERY DEALERS INC. of New Haven.

The factory was purchased a year ago by the CHASE BRASS & COPPER CO. but has been idle since then. FRED A. JACKLE, works manager of the latter company, says that the plant is being remodeled for renewed operations.—W. R. B.

Connecticut Notes

June 18, 1937.

BRISTOL—The BRISTOL BRASS CO. paid an extra dividend of 50 cents and the regular dividend of 50 cents per share on June 15. The company also increased wages 5 cents an hour this month.

ALDEN C. PURRINGTON, assistant secretary of the ASSOCIATED SPRINGS CORP., has been made controller and assistant treasurer to succeed DWIGHT BUFFUM who died recently. CARL SEEBER, controller of the WALLACE BARNES CO., has been appointed assistant secretary of the former company, and FRANCIS L. HASKELL, accountant of the WALLACE BARNES CO., has been appointed controller of that concern.

CHARLES B. SIMMONS, formerly with the INGRAHAM CLOCK CO. and the NEW DEPARTURE CO., has been appointed works manager of the SESSIONS CLOCK CO.

The BRISTOL BRASS CORP., INGRAHAM CLOCK CO. and the WALLACE BARNES CO. have announced one week's vacation with pay and the NEW DEPARTURE CO. is considering such a move.

HARTFORD—Workers of the ARROW-HART & HEGEMAN CO. voted to accept one week's layoff without pay rather than have 200 employees laid off. Workers of the PLIMPTON MFG. CO. are out on a strike due to a demand of the C. I. O. union for a pay increase.

NEW BRITAIN—STANLEY WORKS and LANDERS, FRARY & CLARK have announced one week's vacation with pay for all employees.

In the Federal Court of this district, the suit of the APEX ELECTRICAL MFG. CO. against LANDERS, FRARY & CLARK for alleged patent infringement is now being heard; involves washing and ironing machines.

The NEW BRITAIN MACHINE CO. has orders on its books which assure continuous operation throughout the summer.

TORRINGTON — The TORRINGTON CO. will pay a dividend of 70 cents a share on June 25. This is the first dividend on the new stock recently issued. The UNION HARDWARE CO. paid a special dividend of $5 a share on June 20. On May 15 it paid the regular dividend of $1.50 a share.

WINSTED—The GILBERT CLOCK CO. this month increased wages approximately 5 cents an hour and granted one week's vacation with pay.—W. R. B.

(To test pulling power of post Convention Issue of Metal Industry)

I will give you a SPECIAL Formula for oxidizing BRASS and a FREE sample of

McKEON'S

"Liquid Sulphur"

TRADE MARK REG'D

"The Oxidizing Agent of Today"

ASK for it.

SULPHUR PRODUCTS CO., Inc.

Greensburg, Pa.

Leaves metal clear and bright!

The photo at the left shows a steel panel coated with an oil that is not removable by any alkaline washing procedure.

The lower half of the panel was immersed for one minute in a Magnus Emulsion Degreasing liquid at room temperature. It was given a cold water spray rinse; then dried and photographed.

The Magnus Emulsion Degreasing Method quickly and thoroughly removes not only oil, but black smut, leaving the metal clear and bright. This is most important particularly in bright plating.

This product has given excellent results on cleaning the interiors of deep drawn work, tubes, before bright plating and before bonderizing.

Write for Special Data Sheet on Magnus No. 78.

MAGNUS CHEMICAL COMPANY

Manufacturers of Cleaning Materials, Industrial Soaps, Metallic Soaps, Sulfonated Oils, Emulsifying Agents and Metal Working Lubricants.

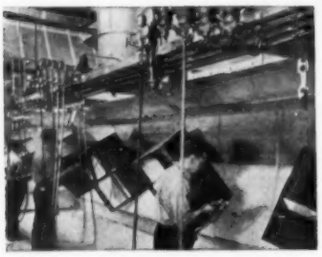
11 South Avenue Garwood, N. J.

MAGNUS CLEANERS

BINKS *THOR* Model 7

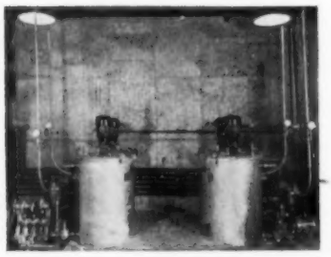
SPRAY GUN

WHERE BETTER FINISH COUNTS!



★ Spraying "Hotpoint" appliances on conveyor, Water Wash Booth equipped, at Edison General Electric Appliance Co., Inc., Chicago.

★ Use the same Spray Equipment that finishes your new automobile—new range — refrigerator. Binks Spray Equipment finishes the products of these and many other internationally known firms.



★ Two line paint circulating System at Sparks-Withington Co., Jackson, Michigan.

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Makers of Complete Spray Finishing Systems—Spray Guns—Material Containers—Regulators—Spray Booths—Exhaust Fans—Hose and Connections—Accessories.

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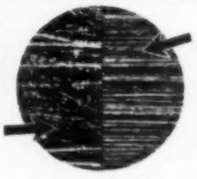
Compare the finish you are getting



with the finish you want to get

It's Simple and Easy with the
BUSCH COMPARISON MICROSCOPE

Side-by-side microscopic comparison is the only way to make sure—whether about lapped or ground finish, quality of welds, grain structure of metals, paper fibers, textiles, etc. That's the way you see it in the Busch Comparison Microscope. Your sample or standard specimen is shown edge-to-edge with the piece to be inspected, both magnified from 15 to 210x. Far more than a laboratory instrument—a sturdy, service-giving tool which brings a scientific principle to every-day practical use. Bulletin M.E. gives all details—Write NOW.

GEORGE SCHERR CO., 122 Lafayette St. New York, N. Y.

Providence, R. I.

June 18, 1937.

Metal trade industries in Rhode Island for the month of May led payroll gains from a year ago, according to the monthly report of the BROWN BUREAU OF BUSINESS RESEARCH released about the middle of the month. The payroll increase of iron and steel products concerns amounted to 60.2 per cent, and a similar gain occurred in non-ferrous metal establishments. Payrolls of all leading manufacturing industries were substantially larger for the month of May than in the corresponding month a year ago, the manufacturing total being 35 per cent. This, with a total of $11,750,823, was an increase of 1.4 per cent over the month of April. Jewelry and silverware industries showed an increase over May, 1936 of 18.7 per cent. The payrolls in the non-ferrous group for May totaled $319,923 and in the jewelry and silverware group to $951,540.

JOSEPH L. TOMALIS of Providence, has been awarded a patent for screw manufacture, which he has assigned to the AMERICAN SCREW COMPANY.

STETSON PRODUCTS CORPORATION of Providence has been incorporated under the laws of Rhode Island to manufacture and deal in jewelry novelties. Its authorized capital stock consists of 500 shares of common stock of no par value. The incorporators are: MARGARET M. WRYNN, FREDERICK A. BROWN and ROBERT L. SHERIDAN all of Providence. The same incorporators have received a charter to manufacture and deal in jewelry novelties under the style of HAMILTON CHAIN CORPORATION, with a capital of 500 shares of common stock of no par value.

T. W. LIND COMPANY has announced its intention of opening a branch office in New York City at an early date and that HAROLD BERG will be its representative covering the New York territory.

THE NEW ENGLAND MANUFACTURING JEWELERS' AND SILVERSMITHS' ASSOCIATION has issued a new "Buyers' Guide," which lists the members of the Association with the type of their productions and an approximate of the retail selling prices.

The METAL FINDING MANUFACTURERS' ASSOCIATION has re-elected its full board of officers for a third term as follows: *President*—EDGAR E. BAKER, president-treasurer of the W. R. COBB COMPANY; *Vice President*—JOSEPH P. WHITAKER, of WHITAKER-FIELDING COMPANY; *Secretary*—WILLIAM A. H. WELLS, president-treasurer of the WELLS FINDINGS CORPORATION and *Treasurer*—FRANK FARNHAM, president-treasurer and general manager of the JEWELERS' SUPPLY COMPANY, INC. The firm of P. A. WILLEMIN was added to the membership.—W. H. M.

Utica, N. Y.

June 18, 1937.

A slight dropping off in activity due to the summer months was noted up and down the Mohawk Valley among the metal plants but the general tone of business continued to be even throughout the territory in early June.

No great changes of any kind were announced although the UTICA CUTLERY COMPANY plant was not at peak due to the seasonal slump in that field.

Reports from Rome were to the effect that early summer figures on employment would show a slight drop from the spring average according to officials of the REVERE BRASS & COPPER and the GENERAL CABLE CORPORATION.

May figures given out by the UTICA CHAMBER OF COMMERCE showed that general conditions in Utica were much better than those of year ago. In May of 1936 there were 19,807 employed in Utica factories while this year the total for May came to 24,550. Carloadings out of Utica for May 1937 were 3,157 compared with 2,935 for a year ago

—E. K. B.

Newark, N. J.

June 18, 1937.

All employees have returned to work at the plant of the Driver-Harris Co., Harrison, following a strike. Nearly 800 employees were affected by the walkout. The workers will receive a 15 per cent pay increase, one week vacations with pay, time and a half for overtime, seniority rights and a 40-hour week.

Settlement of the strike at the Tippett & Wood Co., plant at Phillipsburg, has been made. About 125 employees were on strike. Agreements regulating wages, hours and working conditions are to be considered within the next few weeks. The plant of the Hatfield Wire & Cable Co., Hackettstown, was also affected when 17 employees went on a sit-down strike. The strikers asked for higher wages, shorter working hours and deduction of dues from pay checks. The General Instrument Corp., Elizabeth, has signed a contract with the union, affecting 300 employees. The agreement provides for a closed shop, a 44-hour week, wage increases averaging 19 per cent, and union recognition. The Aluminum Co. of America, Pittsburgh, is constructing one and two story plant addition and 12 melting buildings at Edgewater, N. J.—C. A. L.

Trenton, N. J.

June 18, 1937.

The plant of the ROLLER BEARING COMPANY OF AMERICA at Trenton was again closed by strike after the first labor trouble had been settled and the 165 employees had returned to work. The first strike lasted for several days when the employees returned pending negotiations with the firm. When certain points could not be agreed upon the workers again quit. The employees are seeking higher wages and a recognition of their union, which is affiliated with the C.I.O. The men also ask for a 40-hour week, time and a half for overtime, double time for holidays and Sundays and improved plant conditions. An appeal has been made to the NATIONAL LABOR RELATIONS BOARD in an attempt to settle the trouble.

PREMIER LABORATORIES, INC., Trenton, has leased a two-story factory building on Bloomsburg Street and will increase its number of employees after improvements have been made. The company has another plant on the same street.

Trustees for the estate of the late SIEGFRIED ROEBLING, former second vice-president of the JOHN A. ROEBLING'S SONS CO., Trenton, have announced that he left an

with Du Pont's Bright Zinc Barrel Plating Process

DURABLE . ATTRACTIVE . RUST-RESISTANT

DEEP RECESSES get an even, extra-bright deposit of zinc. That's because of the superior "throwing power" of the du Pont Bright Zinc solution. The coating is now brighter than ever, due to the new brightening agent developed for barrel plating by the R. & H. Research Laboratories.

Recent improvements in this modern plating process have made it more economical than ever . . . ideal for building hardware, radio and electrical parts, stampings, and other equipment.

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M&W CHROME RACK ENAMEL

PROTECTION FOR CHROME PLATING RACKS

With Chrome Rack Enamel, you can insulate your racks in your own plant. No need for outside insulating service.

This enamel is now being used in most chrome plating plants, large and small. It saves time and money; avoids production delays.

Applied like ordinary enamel. Dries with the speed of lacquer. For dipping or brushing. Two colors: red or black.

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Don't GLAZE your polishing wheels by using a cheap Greastick for "fining" and grease wheel polishing.

Use TALLO-STICK, a pure, hard body, white tallow in bar form. It keeps the wheels open—gives ample lubrication—lengthens life of abrasive set-ups—goes farther doing better work. Request free sample of one of the following three standard grades:

No. 26—general all purpose
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WALKER'S *New Metallic Pyroxylin Finishes*

Excellent Adhesion
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(with one coat)

Walker's Metallic Pyroxylin Finishes are eye-appealing. The rich high lustre attracts instant attention—helps to sell goods. That is why Walker Finishes are widely used on electrical objects, lamps, toys, novelties, etc.

Walker's Metallic Pyroxylin Finishes have many uses and applications.

Furnished in Gun Metal, Gold, Silver, Bronze, Copper and Pastel shades.

Write for finished SAMPLES of this new finish, and color chart.

H.V. WALKER CO.

Makers of Fine Finishes

ELIZABETH NEW JERSEY

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1. *"Non-Strike"—no need for high initial current density.*
2. *Higher Throwing Power—plates uniformly into deepest recesses.*
3. *No Black Streaks on zinc at any current density.*
4. *A Dense, Adherent Deposit of fine grain structure.*
5. *Easy to Use—a non-critical bath, simple to maintain at full efficiency.*
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THE ONE
Nickel-plating Solution
FOR 100
Plating Problems

"Problem" jobs are all in the regular day's routine in plants where Zialite solution is being used for every nickel-plating purpose. Objects with parts of different metals; zinc or zinc-base die-castings; complicated shapes with deep recesses; bright plate on brass or copper—all go through with a minimum of operating difficulties and rejects and a maximum of economy.

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estate of $1,204,580. MR. ROEBLING died suddenly on a trip to California.

Following concerns have been incorporated here: UNITED STATES CHROMIUM CORP., Elizabeth, $5,000; J. SEPENUK & SONS, INC., Jersey City, copper and brass products, 100 shares, no par; A. & B. WELDING CO., INC., Jersey City, 1,000 shares, no par.—C. A. L.

Detroit, Mich.

June 18, 1937.

Manufacturing seems to be hitting a slower tempo in this area, due to two factors. First, the approach of the regular summer recession, and second, the labor troubles which, it seems, just cannot be satisfactorily adjusted. Many manufacturers declare they are losing heart, and it would not be surprising if some of the most seriously hampered were forced to close for an indefinite period.

In spite of all its handicaps through the last several weeks, the motor car industry has managed to muddle through, and is still able to maintain substantial production records. Of late, however, it also is showing signs of tapering off, due mostly to labor troubles.

Sit-down strikes, it is gratifying to report, are not so persistent or pressing, but picketing is rampant and accompanied by violent and other coercive methods. Judging from the present these practices may continue to disturb manufacturing and business throughout the summer months.

One of the outstanding strikes settled this week was that at the TERNSTEDT MANUFACTURING CO., a subsidiary of the GENERAL MOTORS CORP., which sent 12,000 employees back to their machines. This concern produces automobile accessories, such as metal trimmings, locks, etc. The Union voted to accept the company's proposal to complete a change from piece work to hourly wage rates, within two weeks.

The BRIGGS MANUFACTURING CO. and the MOTOR PRODUCTS, both in Detroit, it is announced, have removed legal and tax obstacles for an early merger. These two organizations manufacture motor pars. Under the terms of the merger as proposed last fall, it is stated, holders of MOTOR PRODUCTS stock will receive two shares of Briggs for each three of Motor Products owned.

Production of low-cost airplanes will start here in Detroit within a year, if a satisfactory factory site is available, CLARENCE D. CHAMBERLIN, transatlantic flier, recently announced. He said his plans also included the production of military planes to be sold abroad. Backing of $300,000 already has been pledged, it is stated. "We are anxious to establish our plant here," MR. CHAMBERLIN said, "because of the many conveniences Detroit affords."—F. J. H.

Los Angeles, Calif.

June 18, 1937.

The MASTERBUILT COACH TRAILER CO. have built a new factory to cost $800,000 at 1795 Pasadena Ave., average cost of trailers is $700 and their output will be doubled.

The GENERAL CONTROLS CO. have broken ground for a $185,000 factory at Allen & Flower Sts., at the end of the city line of Glendale. They will make all controls for

gas, oil, refrigeration and air conditioning. Work will be started in a few days on the factory for the ALUMINUM CO. OF AMERICA, W. C. LYNCH, local manager. They will put up four buildings, to cost $750,000 and employ 300 men. Enlargements now contemplated will make the cost $1,000,000.

The BAK-A-NAMEL CORP. have recently made the largest bake enameling unit ever produced in the country. ROBERT W. GUNN is president.

The PACIFIC WIRE PRODUCTS CO. of Los Angeles have started at Compton, the erection of a $500,000 plant. They will have 25,000 square feet and fabricate screen wire.

The JOHNS-MANVILLE CO. of New York City have bought a large tract at Alameda Ave. and 283d St. and will build a $1,000,000 plant. They are getting in the air conditioning line a lot now as well as piping and other products. FRANKLIN SHUEY vice president for the Pacific Coast is in charge of operations.

The ATLAS BRASS FOUNDRY of 1901 Santa Fe Ave., will spend $50,000 on enlargements, FRANK ANDERSON, president.

The EXCELSIOR RADIATOR CO. of Chicago will establish a branch plant at 931 East 62d St.

The L. A. YOUNG SPRING & WIRE CO. will enlarge their factory at 3200 East Slauson Ave.

The MECHANICAL FOUNDRIES will enlarge their factory and equipment at 4545 Pacific Blvd.

The H & M THERMAL CONTROL CO. are to build a large addition to the factory at 808 East 10th St.

The QUALITY ELECTRIC CO. have moved to 1235 East Olympic Blvd. and doubled factory and equipment for the making of transformers, measuring instruments, etc., J. O. CASE, president.

The VARD MECHANICAL LABORATORY of Pasadena are making scientific instruments.

The OLYMPIA PRODUCTS CO. have taken up a new line, making all kinds of stills.

The NORTHILL CO. are now making here airplane metal parts.

COLMONOY CO. of Los Nietos, which metal was developed by NORMAN W. COLE, have now got up a new alloy, with a nickel base, impervious to corrosion and a new copper alloy.

The RIEBER SONOGRAPHIC SYSTEM are manufacturing new apparatus to measure sound deep down in the earth, also films of the earth vibrations and an eye on photo electric device.

The SALISBURY CORP. have organized to make "motor glide," a small motor bike, which travels 140 miles on one gallon of gas.

ZIG ZAG FASTENER CO. whose factory burned, have now built a new factory at 1989 West Washington Blvd., K. T. SNYDER at the head.

The LOGAN SALES CO., 5225 Wilshire Blvd., are now making spray heads for spraying water, chemicals, all liquids, liquid metals, etc.

The MODERN METAL ARTS CO. have started at 4161 South Main St., making shower baths.

The LEWIS MFG. CO., 125 West 35th St. are making a new vacuum cleaner for cleaning automobiles.

B. O. BUSHNELL, 520 Anderson St. has started making temperature controls.—H. S.

1896 1937

The value of any product is based on the service it renders.

OUR Standard U.S.A. BRAND Felt Wheels

have the wearing qualities that reduce your total costs.

The wheels will prove this on every test.

SHEET FELT—all grades and hardnesses

for Rubbing, Buffing, Polishing and Mechanical purposes. Evenly felted, no soft spots.

EASTERN FELT COMPANY

Manufacturers

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TRADE MARK

MATCHLESS

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YOU
HIRE THE BEST WORKMEN
WHY NOT GIVE THEM THE BEST TOOLS?
BY BUYING ON PRICE ONLY YOU
PAY
MORE FOR LESS
A REAL TEST WITH
MATCHLESS HIGH GRADE BUFFS
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WILL PROVE THAT
There is no substitute for "MATCHLESS"

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ULTREX

THE MODERN METAL CLEANER

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Time worn and time consuming cleaning methods are discarded when ULTREX fills your tanks.

A new scientific achievement brings you better and faster metal cleaning results at unusually low costs.

Cold rolled steel cleaning, general all around cleaning, aluminum cleaning without etching, are no longer problems when cleaned with ULTREX.

ULTREX CHEMICAL PRODUCTS, INC.

257 FREEMAN STREET BROOKLYN, N. Y.

Agateen LACQUERS

All types of Clear Lacquer for Metals

BUFFING LACQUER

for Cloisonne Reproductions

Air-Dry Priming Lacquer

Water Dip Lacquer

Elastic *Non-blushing*

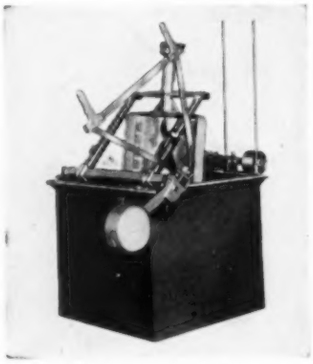
Agate Lacquer Mfg. Co., Inc.

11-13 Forty-third Road, LONG ISLAND CITY, N. Y.

Agateen—*The Last Word in Quality*

DANIELS PLATING MACHINES Patent No. 1936382

Designed to reduce the cost of plating small articles in bulk



TYPE O.L.S. Made in Four Sizes

THE machine is built strong and operates rapidly due to a novel feature in the designing of the conductor frame. The frame has a four point contact so placed in the bottom of the container that the current is equally distributed to all articles being plated. The result is a uniform deposit; eliminates the depositing or treeing of metal on any part of the machine.

DANIELS PLATING MACHINE CO., INC.

129 Oliver Street, Newark, N. J.

WATER WHITE LACQUER COOPLAC NO. 82

● Adds distinction and longer life to your product. Will not crack or curl in cold weather, or become tacky in moist humid weather, and does not darken with age.

Recommended for:

Gold, silver and other metals, plated articles, hardware, buckles, hinges, etc.

An exceptional value, let us quote you. Also a full line of Platers' Chemicals.

COOPER'S CERTIFIED CHEMICALS

Works, Newark, N. J.

Established 1857

CHARLES COOPER & COMPANY

196 WORTH STREET, NEW YORK, N. Y.

Metal Developments

Announcement is made by DR. E. E. DREESE, Chairman of the Board of Trustees and the Jury of Awards of the JAMES F. LINCOLN ARC WELDING FOUNDATION, Cleveland, Ohio, clarifying the object of the Foundation's $200,000 Series of Awards.

"The idea expressed in letters and reports from the industrial field that the opportunities of the Lincoln Foundation's $200,000 awards are available only to individuals familiar with electric welding and its use, is entirely erroneous," states Dr. Dreese.

"Men engaged in designing or building any machine, product or structure, whether they are familiar with welding or not, who feel they want to take part in the award program, should do so by all means. If doubt exists regarding any phase of the program, inquiries addressed, 'Secretary, The James F. Lincoln Arc Welding Foundation, P. O. Box 5728, Cleveland, Ohio,' will receive prompt attention."

A three-year research program on the fundamental properties and behavior of tin has been established in the METALS RESEARCH LABORATORY at the CARNEGIE INSTITUTE OF TECHNOLOGY, Pittsburgh, Pa., by the BRISTOL-MYERS CO., Hillside, N. J. DR. GERHARD DERGE will be in charge of the work and will be assisted by JOHN WARREN STEWART and PAUL A. BECK. The research will be under the direction of DR. R. F. MEHL, director of the laboratory.

STANDARDS OF DUST CONTROL PRACTICE are rapidly nearing completion by the Engineering Committee of the DUST CONTROL EQUIPMENT ASSOCIATION, according to an announcement by ARTHUR J. TUSCANY, executive secretary of the Association, Penton Bldg., Cleveland, Ohio.

An announcement from the BUREAU OF STANDARDS states that *Simplified Practice Recommendation R*115-30 *on Full Disk Buffing Wheels* has been reaffirmed without change by the Standing Committee of the industry and that the existing schedule of recommended diameters remains exactly the same. Full details of this recommendation can be obtained from the Bureau of Standards, Division of Simplified Practice.

Verified Business Items

AUTOMOTIVE STAMPING & MFG. CO., 6000 Beniteau Ave., Detroit, Mich., has been organized to conduct a general manufacturing business. CHAS. H. SOMERS, general mgr. and vice-president. Departments: tool room, cutting-up shop, stamping, grinding, lacquering.

AIR ASSOCIATES, INC., Garden City, N. Y., manufacturer of airplanes and parts, plans expansion and improvements, including con-

siderable new equipment. Company has arranged for sale of 40,000 shares of stock, part of proceeds to be used for purpose noted. F. LEROY HILL is president. Departments: tool room, stamping, electroplating.

KINGSTON PRODUCTS CO., Kokomo, Ind., has taken over H. A. DOUGLAS MFG. CO., Bronson, Mich., manufacturer of electrical parts for automobiles, and will continue to operate the company as a subsidiary. KINGSTON PRODUCTS CO., manufactures automobile parts, brass specialties, castings, etc. Departments: brass machine shop, tool room, stamping, polishing and buffing, electroplating.

BENRUS CO., Waterbury, Conn., manufacturer of wrist watches, expended $75,000 recently in purchasing a seven-story building, which it has been utilizing on a lease for the past two years. BENJAMIN OZAROFF, general manager of the local plant, announced that the BENRUS COMPANY would not make Waterbury its exclusive center of production. The company's present headquarters are located in New York City. The local plant employs a force of 300 workers and occupies at present four stories of the building it has purchased. Departments: tool room, cutting-up shop, stamping, soldering, brazing, grinding, polishing and buffing, electroplating, lacquering.

The MECHANICAL GOODS DIVISION of UNITED STATES RUBBER PRODUCTS, INC., 1790 Broadway, New York has announced that C. W. GILMER, Manager Mechanical Sales, Seattle, Washington, Branch, has been transferred to the New York office, 1790 Broadway, New York, N. Y., as Belting Sales Engineer, operating under T. A. BENNET, Manager Belting Sales. L. F. KOEPP, formerly salesman in the Seattle District, has been appointed Manager Mechanical Sales to take MR. GILMER'S place in the Seattle Branch.

ATLANTIC BRASS & COPPER CO. is now at its new address, 593 Broadway, New York, with a full line of sheet, rod and tubing.

J. W. PATERSON, president of the Hudson Smelting and Refining Company, Newark, N. J., announces the appointment of A. W. DEIMEL, formerly with COSMO METAL ALLOYS CORPORATION, New York City, and the BEERS ALLOYS & CHEMICALS COMPANY, INC., Brooklyn, N. Y., as manager of the INDUSTRIAL METAL COMPANY, INC., 85-95 Hyatt Avenue, Newark, N. J.

INDUSTRIAL METAL COMPANY, INC., which is a wholly owned subsidiary of the HUDSON SMELTING AND REFINING COMPANY, will increase its activities in the field of metal specialties, handling nickel and nickel alloy scrap and residues.

JOHN OAKEY & SONS LTD., Wellington Mills, London, England, are manufacturers of Oakey's emery and emery cloth for metal grinding, polishing, etc. Their representatives in the United States are HAAS BROS., 75 West St., New York City.

SKILSAW, INC., 3345 Elston Ave., Chicago, Ill., announce the election of EDWARD W. RISTAU as vice-president. MR. RISTAU will

Western

The Source of Precision Products

Today, many large manufacturers in leading industries use Western metals exclusively. They have found that Western metals stamp out waste and save them thousands of dollars annually. Western engineers and craftsmen work with tools, gauges and machines as precise as those of a watchmaker. Western customers get the benefit of this fine workmanship which has built up a reputation for precision that just didn't happen over night. That's why it will pay you to standardize on Western metals.

WESTERN CARTRIDGE COMPANY
EAST ALTON, ILLINOIS

BRASS : BRONZE : PHOSPHOR BRONZE
NICKEL SILVER

Western BRASS PRODUCTS
Western Cartridge Company
East Alton
Illinois

Etching Cel-u-lak

• The etched metal industries have their own unique and specific requirements for finishing materials. We have studied them and supplied successfully formulations ideally adapted to the purpose. ¶ ETCHING CEL-U-LAK covers a wide variety of colored finishes on a composite cellulose-synthetic resin base with the following characteristics:

1. **Great adhesion to steel, brass, zinc, etc.**
2. **Marked flexibility toward usual forming and blanking.**
3. **Clean and rapid removability from resist with usual resist solvents. Solvent leaves background of Cel-U-lak unaffected.**
4. **Usual hardness for above qualities.**

In conjunction with these colored finishes we offer a clear, pale silver lacquer of remarkable stability and adhesion.

THE VARNISH PRODUCTS CO.
CLEVELAND, OHIO

CLEPO CLEANING COMPOUNDS

CLEPO *Not just a cleaning compound but a*

Scientific Cleaner Service . . .

Metal Cleaning is a simple matter when everything is right. But everything is right only when the cleaning operation begins where the cleaning compound is made, and ends in your plant through the medium of unremitting service by the maker of the compound. **CLEPO** cleaning compounds are sold on that basis.
CLEPO service does not consist simply of leaving you with a quantity of chemical. It includes a definite effort to aid you in fitting the right cleaner to each job in your plant. We believe this method is the only means by which you can reduce rejects to the barest minimum and eliminate blistered or peeled deposits, or other defects caused by improper cleaning.
CLEPO cleaners do this because they are scientifically compounded of high purity chemicals; always uniform; always supported by **CLEPO** service.

FREDERIC GUMM CHEMICAL CO., INC.
538-542 FOREST STREET **KEARNY, NEW JERSEY**
TECHNICAL ADVISORS and SALES REPRESENTATIVES
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METROPOLITAN — WESTERN — PHILADELPHIA

In Every Barrel

A BALANCED TEAM

GREASE and oil need a double acting cleaner. That's why Metso is popular with platers. Metso has a balanced action:

1. Active alkali to remove all grease
2. Proper silicate content to keep grease and dirt from redepositing on parts cleaned

Metso speeds up your production by reducing defects. Try it in your plant.

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General Offices & Laboratory: 125 S. Third St., Philadelphia.
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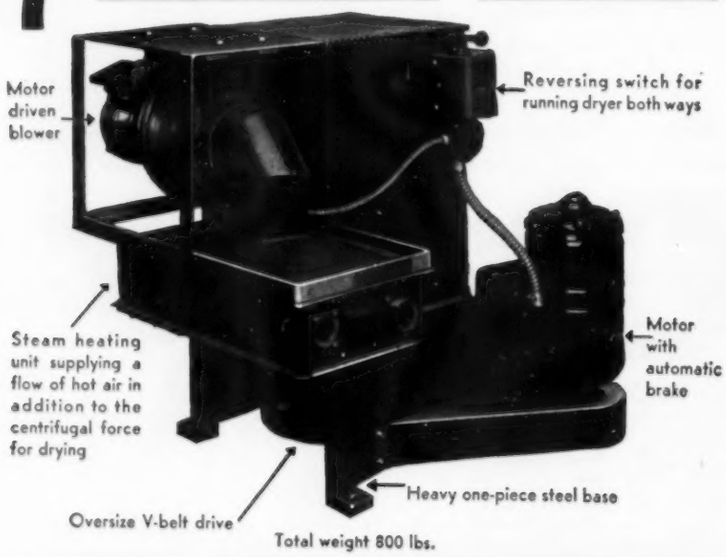
METSO CLEANERS

CROWN
CENTRIFUGAL DRYER

for the plating room
with or without heating unit

7 OUTSTANDING FEATURES


Motor driven blower
Reversing switch for running dryer both ways
Steam heating unit supplying a flow of hot air in addition to the centrifugal force for drying
Motor with automatic brake
Heavy one-piece steel base
Oversize V-belt drive

Total weight 800 lbs.

CROWN RHEOSTAT & SUPPLY CO.
1910 MAYPOLE AVENUE
CHICAGO, ILLINOIS

continue his work of the past five years in directing sales, advertising and promotion.

SCOVILL MFG. CO., Waterbury, Conn., has recently completed an annealing and storage house.

DOEHLER DIE CASTING CO., Toledo, Ohio, re-elected the following officers: H. H. DOEHLER, chairman of the board; F. J. KOEGLER, president; L. H. PILLION, vice-president in charge of eastern sales; A. G. GUTMUELLER, vice-president and assistant to the president in charge of Pottstown plant; C. PACK, vice-president in charge of research and development; R. BERNHARD, treasurer and K. KNOEBEL, secretary. In addition to the above, E. R. ZABRISKIE, formerly western sales manager, has been elected to the office of vice-president in charge of western sales.

DELCO-REMY CORP., Anderson, Ind., manufacturer of automobile starting and lighting equipment, has acquired about 60 acres near plant for one-story unit, 240 x 520 ft. primarily for manufacture of starting motors, parts production and assembling. A one-story office building 50 x 190 ft., also will be built. Cost over $500,000 with equipment.

RALPH K. ULRICH has been appointed manager of the CASH REGISTER DIVISION of the OHMER REGISTER CO., Dayton, Ohio, and HOWARD S. MARTS has been made assistant manager.

NORTON CO., Worcester, Mass., will erect a new building adjoining its plant, 100 x 300 ft. to house its grinding wheel finishing department. Cost about $300,000.

AVIATION MFG. CORP., 828 Cerritos St., Downey, Calif., manufacturer of airplanes and parts, has let general contract for one-story assembling unit, 120 x 300 ft. for its Vultee Division. Cost close to $150,000 with equipment.

HOWARD BRASS & COPPER CO., 608 S. 2nd St., Milwaukee, Wisc., has purchased adjoining four-story building of Maxwell Ray Co., adding about 15,000 sq. ft. for manufacturing and warehousing. The floors are of concrete which are well suited for all heavy work. Departments: brass machine shop, cutting-up shop, soldering, brazing.

NORTHLAND MFG. CO., Phillips, Wisc., has been organized with capital of $25,000 to manufacture windshield heaters and other automobile comfort specialties. The incorporators are: A. JENSEN, WILLIAM A. RUKA and E. F. KUDRNA. Departments: tool room, stamping, grinding, lacquering, japanning and enameling.

OSBORN BRONZE WORKS, Clarksburg, W. Va., has absorbed J. F. Osborn's Sons and the Clarksburg Foundry and has moved its offices and plant from 707 W. Main St. to Milford Rd., Clarksburg. The company will manufacture brass, bronze and aluminum castings. The Osborn Bronze Works is owned and operated by Alexander C. Osborn, grandson of the original founder of the firm which was established in 1863. Departments: bronze, brass and aluminum.

H. J. Sanders Brass Fitting Co., 27 S. Desplaines St., Chicago, Ill., has leased two floors in building at 616 W. Adams St., for expansion. The company manufactures lamp parts and other brass specialties.

United Lacquer Manufacturing Corp., has removed its executive offices from Linden, N. J., to 67 West 44th Street, New York City.

Metal Market Review

June 24, 1937.

Copper spent the last four weeks in an apprehensive atmosphere. From time to time there were rumors of rising prices abroad; at other times there were actual price declines. There were doubts and fears about the monthly statistics and about the effect of rising production upon the stocks on hand. The producers' price in the United States remained at 14c per pound electrolytic, but the open market quotations varied within rather narrow limits.

According to statistics issued by the Copper Institute, world's stocks of refined copper increased 8,085 tons in May. Strangely enough, stocks in the United States increased 9,009 tons while stocks abroad decreased slightly.

The price of copper for export varied back and forth from 13.30 to 13.65c per pound CIF. Sales, week by week, were 5,982 tons, 5,257, 5,994 and 6,498 tons, making a total of 23,731 tons.

Curtailment of production abroad is not under consideration at this time because of the meager stocks in the official warehouses and the attitude of the British authorities.

The bill extending the 4-cent import tax on copper was passed by the House of Representatives and approved by the Senate Finance Committee.

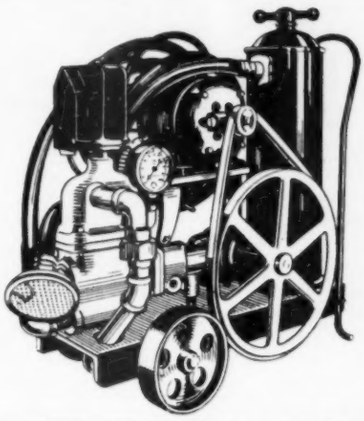
Present situation—dull.

Zinc was also unchanged, remaining at 6.75c per pound E. St. Louis. In spite of lower prices abroad the domestic price structure remained solid abroad because of the scarcity of spotty zinc. Sales and shipments have been proceeding in fair volume in spite of the slowing up of demand due to labor disturbances in the steel mills. Present situation—quiet, but fairly firm.

Tin suffered from the slowing up of deliveries caused by labor difficulties in the steel mills. Also the buying interest was light. The price remained at about 56c per pound for Straits until the third week when it slipped to about 55. It then rose a bit and now rests at 55.875.

Obviously the market is waiting for improved American conditions and the producers are naturally slow in stepping up their production which keeps the price fluctuation for the present within a narrow range.

Lead enjoyed fair demand and although prices remained unchanged, business was quite satisfactory. Sales were 6,428 tons, 4,500, 2,100 and 4,650 tons making a total of 17,678 tons. At this time the price struc-



The STERLING FILTER

Designed to filter nickel, copper, cyanide copper, cadmium, silver solutions, etc., in a thorough and efficient manner without interrupting the plating process. Constructed on an entirely new principle, the filtering element consists of two Monel metal cylindrical screens, one inside the other, the inner screen being covered with two layers of a special cloth. The cloth can be removed for cleaning or replacement within four minutes.

The unit's efficiency is limited only by the capacity of the filter cloths. When that limit is reached an automatic pressure switch stops the motor, making the filter absolutely FOOL-PROOF.

The STERLING FILTER has a capacity of 400 gallons per hour. It is equipped with a 110 volt, 60 cycle motor. The pump parts are made of specially treated material to prevent corrosion and resist wear. Complete unit weighs 130 pounds.

STERLING FILTER MFG. CO.,
43 Hospital Street **Providence, R. I.**

pH PAPERS
NEW METHOD
FOR DETERMINING pH VALUES OF ACID OR ALKALINE SOLUTIONS

SIMPLE—CONVENIENT—DEPENDABLE—QUICK—NO APPARATUS —RESULT IN FEW SECONDS

Just dip strip of pH paper in solution and read off pH value. Can be carried in pocket. Always handy.

PRINCIPAL RANGES: (also others from 0.9—3.4 pH.)

No. I	5.2— 6.7	for nickel
No. II.	3.6— 5.0	for nickel (hot)
No. VI.	9.5—11.0	for brass, cyanide of copper and silver
No. VII.	11.0—13.5	for cadmium, bronze, zinc, and alkaline cleaners.

BOX of 200 STRIPS: $7.50 per box

PAUL FRANK
SOLE IMPORTER
456 Fourth Ave. **New York**
Tel. MU 4-4765

SAVE TIME! GET BETTER RESULTS! INCREASE YOUR PROFITS!

with a

Mall TRADE MARK **UNIVERSAL GRINDER**

More horsepower per pound of weight in the operator's hands than any other grinder on the market.

It will pay you to investigate this portable, efficient, high speed machine for grinding and casting snagging. Also, inquire about the various other MALL grinders. There is a type for every job!

MALL TOOL COMPANY
7756 South Chicago Avenue, Chicago, Illinois
Offices and Distributors in all Principal Cities

INDUSTRIAL FILTERS FOR PLATING SOLUTIONS

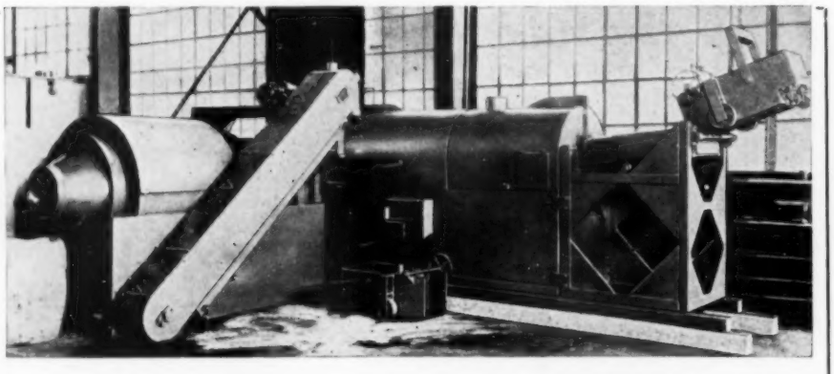
QUALITY PLATING is now the leading "Talking Point" in Electroplating. A necessary requirement to produce such plating is that solutions are kept clean by filtration.

INDUSTRIAL FILTERS are guaranteed to operate at rated capacities and are constructed to stand-up on the job for which intended.

WRITE TODAY for our new complete price schedule, which includes specifications on filters specially designed for *HOT or BRIGHT* nickel solutions.

INDUSTRIAL FILTER & PUMP MFG. CO.
1030 W. North Ave., Chicago, Ill.

Polish to a Mirror-Like *Finish with*
ORIENTAL
COMPOUNDS
STAINLESS STEEL
is polished to a Mirror-Like finish with Oriental Compounds. Rouges and Compositions for Gold, Sterling, Silver Plate and other metals. They produce a durable and economical finish.
We invite your inquiry.
Oriental Rouge Co., Inc.
Established 1901
FACTORY: 66-68 PINE STREET BRIDGEPORT, CONN.



Taking the Drudgery out of Ball Burnishing

Ball burnishing—always desirable—may be made economical if you can eliminate costly hand labor. This Ideal machine takes batches from burnishing barrels, washes and rinses them, automatically separates balls from work, discharges cleaned balls to shop buggy for return to barrel, sends cleaned work to final drum where it is thoroughly dried in hot sawdust and discharged into shop cans. Balls are never manually handled, are washed after each burnishing operation.

May we quote you on an installation tailored to fit your particular requirements?

N. Ransohoff Inc.
West 71st Street at Millcreek
Carthage, Cincinnati, O.

ture is steady in spite of the weakness abroad.

Silver moved hardly at all (from 44¾ to 45c per ounce) with very little business done. The market at this time remains quiet and steady.

Scrap copper for export, early in June sold above domestic levels, but later in the month receded to about the same figures. With primary copper for export selling between ⅜ and ¾ of a cent less than for American consumption, scrap copper is following the trend of the foreign market.

Battery lead offerings were rather poor indicating confidence in the market on the part of the dealers.

Brass and aluminum ingot shipments were slowed up because of the labor troubles in the consumers' plants, and new bookings were also weak. On June 1st, unfilled orders for brass and bronze ingots and billets on the books of the Non-Ferrous Ingot Metal Institute amounted to a total of 18,037 net tons compared with 20,549 net tons on May first.

The combined deliveries of brass and bronze ingot and billets by members of the Institute for the month of May amounted to a total of 8,210 tons compared with 10,101 tons in April.

The Institute reports the average prices per pound received by its membership on commercial grades of the principal mixtures of ingot brass during the 28-day period ending June 11 as follows:

80-10-10 (¼% Imp.)	15.814c
78% Metal	13.007c
81% Metal	13.262c
83% Metal	13.547c.
85% Metal	13.785c
No. 1 Yellow Brass	11.205c

Wrought Metal activities were slower due partly to seasonal influences and partly to labor difficulties. A large Metropolitan distributor reports that June business was 7% above May and 50% above June 1936.

Average Prices for Metals

	June
COPPER c/lb. Duty 4c/lb.	
LAKE (del. Conn. Producers' Prices)	14.062
ELECTROLYTIC (del. Conn. Producers' Prices)	14.00
CASTING (f.o.b. ref.)	13.625
ZINC (f.o.b. E. St. Louis) c/lb. Duty 1¾ c/lb.	
Prime Western (for Brass Special add 0.05-0.10)	6.75
TIN (f.o.b. N. Y.) c/lb. Duty Free, Straits	55.836
LEAD (f.o.b. St. L.) c/lb. Duty 2½ c/lb.	5.85
ALUMINUM c/lb. Duty 4 c/lb.	20.000
NICKEL c/lb. Duty 3 c/lb. Electrolytic 99.9%	35.000
ANTIMONY (Ch. 99%) c/lb. Duty 2c/lb.	14.705
SILVER c/oz. Troy, Duty Free	44.818
PLATINUM $/oz. Troy, Duty Free	50.955
GOLD—Official U. S. Treasury Price $/oz. Troy	35.000

INFORMATION FOR BUYERS

MANUFACTURERS' LITERATURE

PLEASE MENTION JULY METAL INDUSTRY

Chip Proof Colored Flexible Lacquer Enamel. A product summary giving the properties of this cellulose type, air-drying, flexible lacquer enamel. Available in all colors—standard or special match. Does not chip, flake or peel; stands blanking and forming. Samples on brass, aluminum, and cold rolled steel are supplied for test by scratching, bending, etc. Roxalin Flexible Lacquer Co., Inc., Elizabeth, N. J.

"No-Finger-Print" Taupe Finish; "Blue Knight Taupe No. 978 A". A product summary giving properties of this specially pigmented enamel of neutral color. Does not show finger marks, dust or minor defects. Roxalin Flexible Lacquer Co., Inc., Elizabeth, N. J.

Portrait of a Rust-Proof Home. Copper and brass used in building construction. American Brass Company, Waterbury, Conn.

Work Gloves. Fabric gloves coated with Thiokol synthetic rubber coating material. Thiokol Corp., Yardville, N. J.

How to Run a Lathe. The 33rd edition of this Machinist's Manual. South Bend Lathe Works, 425 E. Madison St., South Bend, Ind.

The Futility of Federal Wage and Hour Regulation. By Allen W. Ricker in collaboration with N. W. Pickering, President Farrel-Birmingham Co. Inc., Ansonia, Conn.

"Oiliness". A study in the correlation of laboratory service tests with practical field results on the value of a lubricant. Alox Corp., P. O. Box 556, Niagara Falls, N. Y.

Integrally-casting end rings, fans and rotor bars of alternating current squirrel cage induction motors. Reliance Electric & Engineering Co., 1088 Ivanhoe Rd., Cleveland, Ohio.

Direct Current Motors. 1 to 300 horse power. Century Electric Co., 1806 Pine St., St. Louis, Mo.

Slip Ring Motors. 1 to 350 horse power. Century Electric Co., 1806 Pine St., St. Louis, Mo.

Health Protection of Welders. Industrial Health Section, Metropolitan Life Insurance Co., New York.

Disc Grinding. A production operation; including plate mounted cylinders. Norton Co., Worcester, Mass.

Brown Optimatic Bulletin. No. 91-1, on the optimatic sighting tube, the power supply unit and the instruments, etc. Brown Instrument Co., A division of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.

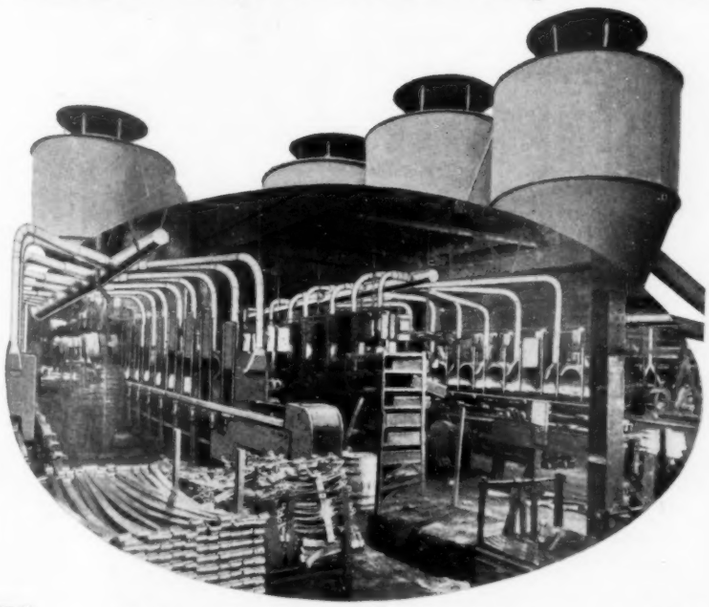
Arc Welded Design Chart. Lincoln Electric Co., Cleveland, Ohio.

Flexible Metal Hose. Rex-Weld and Rex-Tube. Chicago Metal Hose Corp., Maywood, Ill.

Pictorial of Welding Progress. A photo review of arc welding. Lincoln Electric Co., Cleveland, Ohio.

Low Cost Finish; faster production, uniform results. Burnishing barrels. Abbott Ball Co., Hartford, Conn.

MODERN PRODUCTION demands the most MODERN EQUIPMENT dependable 365 days of a year . . .



That is what you obtain when you install a

"CLEVELAND"

DUST COLLECTING SYSTEM

Modern engineers design it; experienced mechanics install it . . . and from then on it functions efficiently, dependably, and at low cost . . .

"28 Years in Business"

EFFICIENCY · INTEGRITY · SERVICE

The Cleveland Blow Pipe and Mfg. Co.

6505 Cedar Ave. . . . . Cleveland, Ohio

INFORMATION FOR BUYERS

MANUFACTURERS' LITERATURE

PLEASE MENTION JULY METAL INDUSTRY

Wheelabrator Data Book. Book No. 211 on the Wheelabrator Tum-Blasts. American Foundry Equipment Co., 408 Byrkit St., Mishawaka, Ind.

Cameron Motorpumps. Electric motor and centrifugal pumps in a single unit. Ingersoll-Rand Co., Phillipsburg, N. J.

Nickel Steel and Chrome Steel Round Edge Flat Wire. American Nickeloid Co., Peru, Ill.

Dual Ventilated Fan Cooled Type CS Squirrel-Cage Motors. Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

M.S.A. Combustible Gas Indicator. Used to test explosive gas hazards and locating leaking gas. Mine Safety Appliances Co., Braddock, Thomas & Meade Aves., Pittsburgh, Pa.

Thermostatic Metals. Laminated Metals Corp., 775 Eddy St., Providence, R. I.

"*The Arc Welding of Tomorrow.*" P&H Smootharc Welders. Book No. W10. Harnischfeger Corp., 4200 W. National Ave., Milwaukee, Wisc.

Rex Belt Conveyors. Chain Belt Co., Milwaukee, Wisc.

Collordata. Developments in the application of rubber to industrial and commercial uses. Collord, Inc., 7049 Lyndon Ave., Detroit, Mich.

Mechanical Topics. A bulletin for metal users. International Nickel Co. Inc., 67 Wall St., New York.

Industrial Furnaces. Catalog No. 369. Fuel fired and electric. W. S. Rockwell Co., 50 Church St., New York.

"*Norblo*" *Round Type Air Filter;* for application where dust particles are extremely fine. Bulletin No. 500-2. Northern Blower Co., W. 65th St., south of Denison, Cleveland, Ohio.

Semi-Automatic Plating Machines. Uniform deposits; close production control. The Udylite Co., 1651 E. Grand Blvd., Detroit, Mich.

Steelflex Couplings. The Spring Damps Out the Shock. Bulletin 4100. The Falk Corp., Milwaukee, Wisc.

Metal Melting Furnaces. Interchangeable for gas or oil fuel; style and capacity to meet every melting problem. Catalog No. 29. Campbell-Hausfeld Co., Harrison, Ohio.

Electroplating Rectifiers. A new source of direct current. Bulletin ER-101; includes a cut of the Rectifier, information as to the construction, installation and operation and also a graph showing the power factor and efficiency curve. Hanson-Van Winkle-Munning Co., Matawan, N. J.

Buffs and Compositions. Bulletin BC-104; contains pictures of the various types of buffs and compositions and a description of their uses.

A Low Cost Tarnish-Resisting Brilliant White Alloy Plate, Harder Than Nickel

PATENTED

"SPEKWITE" IS PATENT PROTECTION ON WHITE ELECTROPLATE

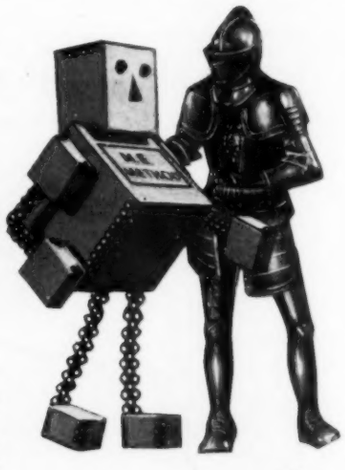
This patented, low cost, decorative, tarnish-resistant, brilliant triple alloy white electroplate . . . . widely accepted by the trade throughout the world because it has so much to offer.
Plates directly over Nickel, German Silver, Brass, Copper, Gold, Silver, Iron and Steel. It will cover all hard solders and a majority of soft solders.
"SPEKWITE" has a high throwing power. Penetrates to deep recesses. Ideal for basket plating and barrel plating and to top it all, "SPEKWITE" offers complete patent protection, and with no increase in prices. Send sample of your product for "SPEKWITE" plating.

Send for complete detailed information and price list.

SPECIAL CHEMICALS CORP.
30 IRVING PLACE NEW YORK, N. Y.

THE solid bond between Mr. M. E. Method and our Blue Knight started with the solution of this problem.

LIKE THAT Since 1929



WANTED—both transparent and opaque coatings for converting raw cold-rolled steel strip into the finished article in one continuous operation . . . without primer. The finish must withstand these following operations without chipping, flaking or peeling.

1. Reeling after finishing.
2. Slitting, Blanking and Punching.
3. Re-reeling in 300 ft. coils.
4. Feeding the edging through the stayer which cuts strip to right length, applies it and clinches it on box corners.
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Metal Edge Boxes (strongest known) have a wonderful reputation for "taking it." ROXALIN Flexible Finishes do their part by thriving on abuse without CHIPPING, FLAKING or PEELING!

Ask for illustrated Summary featuring the "Twist and Bend" strips which tells you a good deal you ought to know about the stamina of ROXALIN Flexible Finishes. Address Box 677, Roxalin Flexible Lacquer Company, Inc., Elizabeth, N. J.

ROXALIN *Flexible* FINISHES

Reg. U. S. Pat. Off.
CELLULOSE & SYNTHETIC TYPES ENGINEERED FOR SPECIFIC PERFORMANCE

Information for Buyers

Homestead Quarter Turn Valves; Hovalco Blow-Off Valves. Homestead Valve Mfg. Co., Box H, Coraopolis, Pa.

Gas Mask. MSA All-Service Gas Mask (Barrel Type) approved by U. S. Bureau of Mines. Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh, Pa.

Molded Plastic Mountings for Zinc Microsections. The Alloy Pot. New Jersey Zinc Co., 160 Front St., New York.

"Collordata" illustrating developments in the application of rubber to industrial and commercial uses. Collord, Inc., 7049 Lyndon Ave., Detroit, Mich.

Corrosion-Resisting Equipment. General catalog. Duriron Co., Inc., Dayton, Ohio.

Optical Aids in the Metal Working Industries. Bausch & Lomb Optical Co., Rochester, N. Y.

Data on Electrical and Motor Maintenance, also mechanical equipment. Ideal Commutator Dresser Co., Sycamore, Ill.

Centrifugal Pumps. Bulletin 5870. Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill.

Self-Oiling Power Pumps. Bulletin 6150. Fairbanks, Morse & Co., Chicago, Ill.

Approved Underwriters Centrifugal Fire Pumps. Bulletin 5814F. Fairbanks, Morse & Co., Chicago, Ill.

Spectrometric Equipment. Catalog D-221. Bausch & Lomb Optical Co., Rochester, N. Y.

Portable Sherardizing Furnaces and Equipment. National Sherardizing & Machine Co., 868 Windsor St., Hartford, Conn.

"Standardizes Quality in the Heat Treatment of Metals." Brown Analy-Graph for heat treating processes; also Brown Protectoglo (combustion safeguard) System. Brown Instrument Co., Division of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.

FOR QUALITY - PLUS
PERMAG
CLEANERS
LEAD
TRADE MARK REG. U.S. PAT. OFF.

We are looking for a HARD, Tough Cleaning Job on Metal

PERMAG Cleaning Compounds are used daily on thousands of metal cleaning jobs; some work is just average, other types are more difficult. But where PERMAG sends its challenge today is to the cleaning job that seems impossible.

Magnuson service takes over such work, and after investigation and research, produces a cleaning compound made specifically for the job which will complete it satisfactorily and economically. We would like to hear from metal fabricators who have just such problems.

MAGNUSON PRODUCTS CORPORATION

Manufacturers of

Specialized Scientific Cleaning Compounds for Every Industrial Purpose

THIRD and HOYT Sts., BROOKLYN, N. Y. Cable Address, PERMAG, N. Y.

Warehouses in principal cities throughout the U. S. Representatives from coast to coast.

NOW... *Tested and Approved!*

Cross-section view of MULTI-EDGE showing 8 corners that give increased throwing power and plating efficiency. It has many other features, yet costs no more than flat or curved anodes of equal weight.

"MULTI-EDGE"

The Amazing New Anode With Greater Throwing Power

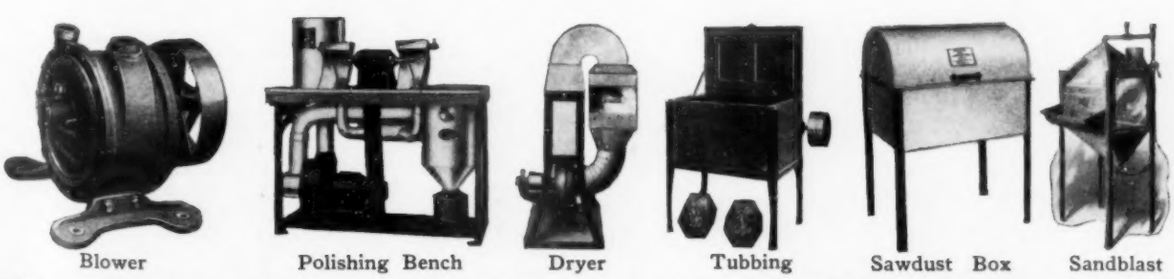
Ample proof of our claims for MULTI-EDGE is found in the many repeat orders we are getting from satisfied users in all sections of the country.

MULTI-EDGE was the best anode on the market when we introduced it a few months ago. Now it is still further improved by a new design which gives the fumes a direct passage to the exhaust hood. It is shaped at the top to provide increased space for drawing off fumes.

Order from your Supply House or write to us for prices.

REPUBLIC LEAD EQUIPMENT CO.

7932 Jones Road — Cleveland, Ohio



Blower — Polishing Bench — Dryer — Tubbing — Sawdust Box — Sandblast

THE BOLAND SYSTEMS FOR FACTORY INSTALLATIONS

Tanks, Coloring Rooms, Dynamos, Sawdust Boxes

H. J. ASTLE & CO., INC. Established 1884 (Send for Catalogs) **118 Orange St., Providence, Rhode Island**

Supply Prices, June 24, 1937

Anodes

Prices, except silver, are per lb. f.o.b., shipping point, based on purchases of 2,000 lbs. or more, and subject to changes due to fluctuating metal markets.

COPPER: Cast ..... 24⅝c. per lb.
Electrolytic, full size, 18⅜c. cut to size ..... 18⅜c. per lb.
Rolled oval, straight, 18⅞c.; curved ..... 18⅞c. per lb.
BRASS: Cast ..... 22½c. per lb.
ZINC: Cast ..... 13¼c. per lb.
NICKEL: 90-92% ..... .45 per lb.
95-97% ..... .46 per lb.
99%+cast, 47c.; rolled, depolarized, 48.
SILVER: Rolled silver anodes .999 fine were quoted June 25, from 48c. per Troy ounce upward, depending on quantity.

White Spanish Felt Polishing Wheels

Diameter	Thickness Under ½"	½-15/16"	1-2"	2-3½"	Over 3½"
Under 1"	6.35-6.40	6.20-6.25	6.10-6.15	6.10-6.15	6.35-6.40
1" to 1 7/16"	5.85	5.70	5.60	5.60	5.85
1½" to 3 15/16"	5.55	5.35-5.40	5.30-5.35	5.30-5.35	5.60
4-5 15/16"	4.95-5.00	4.70-4.85	4.65-4.75	4.65-4.75	4.95-5.00
6", 8" & 9"	3.80-4.25	3.45-3.95	2.45-3.05	2.45-3.00	2.90-3.35
10" to 18"	3.80-4.25	3.45-3.95	2.45-2.95	2.45-2.75	2.90-3.25
Over 18"	3.80-4.25	3.45-3.95	2.70-3.05	2.70-3.00	2.90-3.35

Prices above are for less than 50 lb. For 50 to 99 lb. deduct 5% from list; for 100 lb. and over deduct 10%.

ODD DIAMETERS: (7" & 11" to 17"). Less than 50 lb. add 40c per lb. to above "Even Diameters" list. 50 lb. or over—all one size and consistency and in one shipment—same as "Even Diameters" list above.

On grey Mexican wheels deduct 10c per lb. from above prices.

Cotton Buffs

Full disc open buffs, per 100 sections when purchased in lots of 100 or less are quoted:

16" 20 ply 84/92 Unbleached	$77.70
14" 20 ply 84/92 Unbleached	59.43
12" 20 ply 84/92 Unbleached	44.67
16" 20 ply 80/92 Unbleached	65.72
14" 20 ply 80/92 Unbleached	50.43
12" 20 ply 80/92 Unbleached	37.91
16" 20 ply 64/68 Unbleached	62.13
14" 20 ply 64/68 Unbleached	47.70
12" 20 ply 64/68 Unbleached	35.88

⅜" Sewed Buffs, per lb., bleached or unbleached 59c to $1.58

Chemicals

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone C. P.	lb.	.06½
Acid—Boric (Boracic) granular, 99½+% ton lots	lb.	.05¼-.05¾
Chromic, 400 or 100 lb. drums		.16¼-.16¾
Hydrochloric (Muriatic) Tech., 20 deg., carboys	lb.	.03
Hydrochloric, C. P., 20 deg., carboys	lb.	.06½
Hydrofluoric, 30%, bbls.	lb.	.07-.08
Nitric, 36 deg., carboys	lb.	.05-.06¼
Nitric, 42 deg., carboys	lb.	.07-.08
Sulphuric, 66 deg., carboys	lb.	.029
Alcohol—Butyl, drums	lb.	.10-.10½
Denatured, drums	gal.	.35-.40
Alum—Lump, barrels	lb.	.03¼-.03½
Powdered, barrels	lb.	.0340-.0365
Ammonia, aqua, com'l., 26 deg., drums, carboys	lb.	.02½-.05
Ammonium—Sulphate, tech., bbls.	lb.	.03½-.05
Sulphocyanide, technical crystals, kegs	lb.	.55-.58
Arsenic, white kegs	lb.	.04½-.05
Asphaltum, powder, kegs	lb.	.23-.41
Benzol, pure, drums	gal.	.41
Borax, granular, 99½+%, ton lots	lb.	.0255-.0305
Cadmium oxide, 50 to 1,000 lbs.	lb.	1.60
Calcium Carbonate (Precipitated Chalk), U. S. P.	lb.	.05¾-.07½
Carbon Bisulphide, drums	lb.	.05½-.06
Chrome, Green, commercial, bbls.	lb.	.21-.24
Chromic Sulphate, drums	lb.	.33-.55
*Copper—Acetate (Verdigris)	lb.	.28
Carbonate, 53/55% cu., bbls.	lb.	.17-.20
Cyanide (100 lb. kgs.)	lb.	.37
Sulphate, tech., crystals, bbls.	lb.	.07½
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.20¼-.20½
Crocus Martis (Iron Oxide) red, tech., kegs	lb.	.07
Dextrin, yellow, kegs	lb.	.05-.08
Emery Flour (Turkish)	lb.	.07
Flint, powdered	ton	30.00
Fluorspar, bags	lb.	.03½
*Gold Chloride	oz.	$18¼-23
*Gold Cyanide, Potassium 41%		$15.45
*Gold Cyanide, Sodium 46%		$17.10
Gum—Sandarac, prime, bags	lb.	.50
Shellac, various grades and quantities	lb.	.21-.31
Iron Sulphate (Copperas), bbls.	lb.	.016
Lead—Acetate (Sugar of Lead), bbls.	lb.	.13½-.16¼
Oxide (Litharge), bbls.	lb.	.12½
Lime Compositions for Nickel	lb.	.09½-.11
Lime Compositions for Brass	lb.	.09½-.11
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Methanol, (Wood Alcohol) Pure, drums	gal.	.40½
Nickel—Carbonate, dry bbls.	lb.	.36-.41
Chloride, bbls.	lb.	.18-.22
Salts, single, 425 lb. bbls.	lb.	.13½-.14½
Salts, double, 425 lb. bbls.	lb.	.13½-.14½
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash Caustic Electrolytic 88-92% broken, drums	lb.	.07¼-.08⅝
Potassium—Bichromate, casks (crystals)	lb.	.09
Carbonate, 98-100%	lb.	.06¾
Cyanide, 165 lbs. cases, 94-96%	lb.	.59
Pumice, ground, bbls.	lb.	.03
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Sal Ammoniac (Ammonium Chloride) in bbls.	lb.	.05-.07½
*Silver—Chloride, dry, 100 oz. lots	oz.	.38
Cyanide, 100 oz. lots	oz.	.44
Nitrate, 100 ounce lots	oz.	.32¾
Soda Ash, 58%, bbls.	lb.	.0225
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.17½-.22
Hyposulphite, kegs, bbls.	lb.	.03½-.06½
Metasilicate, granular, bbls.	lb.	2.75-3.15
Nitrate, tech., bbls.	lb.	.0325
Phosphate, tribasic, tech., bbls.	lb.	.03
Silicate (Water Glass), bbls.	lb.	.01½
*Stannate, drums	lb.	.36-.39
Sulphocyanide, drums	lb.	.30-.35
Sulphur (Brimstone), bbls.	lb.	.02¾
*Tin Chloride, 100 lb. kegs	lb.	.41½
Tripoli, powdered	lb.	.03
Trisodium Phosphate—see Sodium Phosphate.		
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
White Silica Compositions for Brass	lb.	.07½-.10
Whiting, Bolted	lb.	.02½-.06
Zinc—Carbonate, bbls.	lb.	.13
Cyanide (100 lb. kegs)	lb.	.36-.38
Chloride, drums, bbls.	lb.	.06
Sulphate, bbls.	lb.	.0405

* Subject to fluctuations in metal prices.

Metal Prices on page 382.

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THE McGEAN CHEMICAL COMPANY
CLEVELAND, OHIO

McGEAN CHEMICALS

Metal Prices, June 24, 1937

(Import duties and taxes under U. S. Tariff Act of 1930, and Revenue Act of 1932)

New Metals

COPPER: Lake, 14.125, Electrolytic, 14.00, Casting, 13.75.
ZINC: Prime Western, 6.75. Brass Special, 6.85.
TIN: Straits 56.50. LEAD: 5.85.
ALUMINUM: 20. ANTIMONY, 14.50.
NICKEL: Shot, 36. Elec., 35.

QUICKSILVER: Flasks, 75 lbs., $99. BISMUTH, $1.00.
CADMIUM, $1.60. SILVER, Troy oz., official price, N. Y., June 25, 44¾c. GOLD: Oz. Troy, Official U. S. Treasury price, $35.00.
SCRAP GOLD, 6¾c. per pennyweight per karat, dealers' quotation.
PLATINUM, oz. Troy $51.00.

Duties: Copper, 4c. lb.; zinc, 1¾c. lb.; tin, free; lead, 2½c. lb.; aluminum, 4c. lb.; antimony, 2c. lb.; nickel, 3c. lb.; quicksilver, 25c. lb.; bismuth, 7½%; cadmium, 15c. lb.; cobalt, free; silver, free; gold, free; platinum, free.

Ingot Metals and Alloys

	Cents lb.	U. S. Import Duty	U. S. Import Tax*
No. 1 Yellow Brass	11.25	None	4c. lb.[1]
85-5-5-5	14.00	None	4c. lb.[1]
88-10-2	18.00	None	4c. lb.[1]
80-10-10	16.00	None	4c. lb.[1]
Manganese Bronze (60,000 t. s. min.)	13.25	None	4c. lb.[1]
Aluminum Bronze	17.50	None	4c. lb.[1]
Monel Metal Shot or Block	28	25% a. v.	None
Nickel Silver (12% Ni)	15.25	20% a. v.	4c. lb.[1]
Nickel Silver (15% Ni)	17.50	20% a. v.	4c. lb.[1]
No. 12 Aluminum	19-25	4c. lb.	None
Manganese Copper, Grade A (30%)	25.50-31	25% a. v.	3c. lb.[1]
Phosphor Copper, 10%	19-21	3c. lb.	4c. lb.[1]
Phosphor Copper, 15%	20-22	3c. lb.	4c. lb.[1]
Silicon Copper, 10%	24-36	45% a. v.	4c. lb.[1]
Phosphor Tin, no guarantee	65-75	None	None
Iridium Platinum, 5% (Nominal)	$54.50	None	None
Iridium Platinum, 10% (Nominal)	$57.00	None	None

Old Metals

Dealers' buying prices, wholesale quantities:	Cents. lb.	Duty	U. S. Import Tax
Heavy copper and wire, mixed	10 to10¼	Free	4c. per pound on copper content
Light copper	9⅛to 9⅜	Free	
Heavy yellow brass	6¼to 6½	Free	
Light brass	5¼to 5½	Free	
No. 1 composition	9 to 9⅜	Free	
Composition turnings	8¾to 9	Free	
Heavy soft lead	4¾to 5	2⅛c. lb.	None
Old zinc	3½to 3¾	1½c. lb.	
New zinc clips	4½to 4¾	1½c. lb.	
Aluminum clips (new, soft)	13 to14	4c. lb.	
Scrap aluminum, cast	11¾to12	4c. lb.	
Aluminum borings—turnings	8 to 9	4c. lb.	
No. 1 pewter	35 to 37	Free	
Electrotype	5 to 5¼	2⅛c. lb.*	
Nickel anodes	26 to 27	10%	
Nickel clips, new	28 to 29	10%	
Monel scrap	8½to 17	10% av.	

*** Duty is under U. S. Tariff Act of 1930; tax under Section 60 (7) of Revenue Act of 1932.**
[1] On copper content. [2] On total weight. "a. v." means ad valorem.

*** On lead content.**

Wrought Metals and Alloys

The following are net BASE PRICES per pound, to which must be added extras for size, shape, quantity, packing, etc., or discounts, as shown in manufacturers' price lists, effective since May 19, 1937. Basic quantities on most rolled or drawn brass and bronze items below are from 2,000 to 5,000 pounds; on nickel silver, from 1,000 to 2,000 pounds.

Copper Material

	Net base per lb.	Duty*
Sheet, hot rolled	21⅞c.	2½c. lb.
Bare wire, soft, less than carloads	18⅛c.	25% a. v.
Seamless tubing	22⅝c.	7c. lb.

*** Each of the above subject to import tax of 4c. lb. in addition to duty under Revenue Act of 1932.**

Nickel Silver

Net base prices per lb. (Duty 30% ad valorem.)

Sheet Metal		Wire and Rod	
10% Quality	29½c.	10% Quality	32⅛c.
15% Quality	31⅝c.	15% Quality	36½c.
18% Quality	32⅞c.	18% Quality	39¾c.

Brass and Bronze Material

	Yellow Brass	Red Brass 80%	Comm'l. Bronze	Duty	
Sheet	19¾c.	20¾c.	21¾	4c. lb.	U. S. Import Tax
Wire	20 c.	21 c.	22	20%	
Rod	16¼c.	21 c.	21⅞	4c. lb.	4c. lb. on copper content.
Angles, channels	28¼c.	29¼c.	30¼	1c2. lb.	
Seamless tubing	22½c.	23¼c.	24⅛	8c. lb.	
Open seam tubing	28¼c.	29¼c.	30¼	20% a.v.	

Tobin Bronze and Muntz Metal

Net base prices per pound.	(Duty 4c. lb.; import tax 4c. lb. on copper content.)
Tobin Bronze Rod	21⅝c.
Muntz or Yellow Rectangular and other sheathing	23 c.
Muntz or Yellow Metal Rod	19⅛c.

Aluminum Sheet and Coil

(Duty 7c. per lb.)

Aluminum sheet, 18 ga., base, ton lots, per lb.	35.50c
Aluminum coils, 24 ga., base price, ton lots, per lb.	31.00c

Rolled Nickel Sheet and Rod

Net Base Prices

Cold Drawn Rods	50c.	Standard Cold Rolled Sheet	49c.
Hot Rolled Rods	45c.		

Monel Metal Sheet and Rod

Hot Rolled Rods (base)	35c.	No. 35 Sheets (base)	37c.
Cold Drawn Rods (base)	40c.	Std. Cold Rolled Sheets (base)	39c.

Silver Sheet

Rolled sterling silver (June 25) 47c. per Troy oz. upward according to quantity. (Duty, 65% ad valorem.)

Zinc and Lead Sheet

	Cents per lb. Net Base	Duty
Zinc sheet, carload lots standard sizes and gauges, at mill, less 7 per cent discount	13.00	2c. lb.
Zinc sheet, 1200 lb. lots (jobbers' prices)	13.75	2c. lb.
Zinc sheet, 100 lb. lots (jobbers' prices)	17.75	2c. lb.
Full Lead Sheet (base price)	9.25	2⅝c. lb.
Cut Lead Sheet (base price)	9.50	2⅝c. lb.

Block Tin, Pewter and Britannia Sheet

(Duty Free)

This list applies to either block tin or No. 1 Britannia Metal Sheet, No. 23 B. & S. Gauge, 18 inches wide or less; prices are all f. o. b. mill:

500 lbs. over	15c. above N. Y. pig tin price
100 to 500 lbs.	17c. above N. Y. pig tin price
Up to 100 lbs.	25c. above N. Y. pig tin price
Up to 100 lbs.	25c. above N. Y. pig tin price

Supply Prices on page 380.

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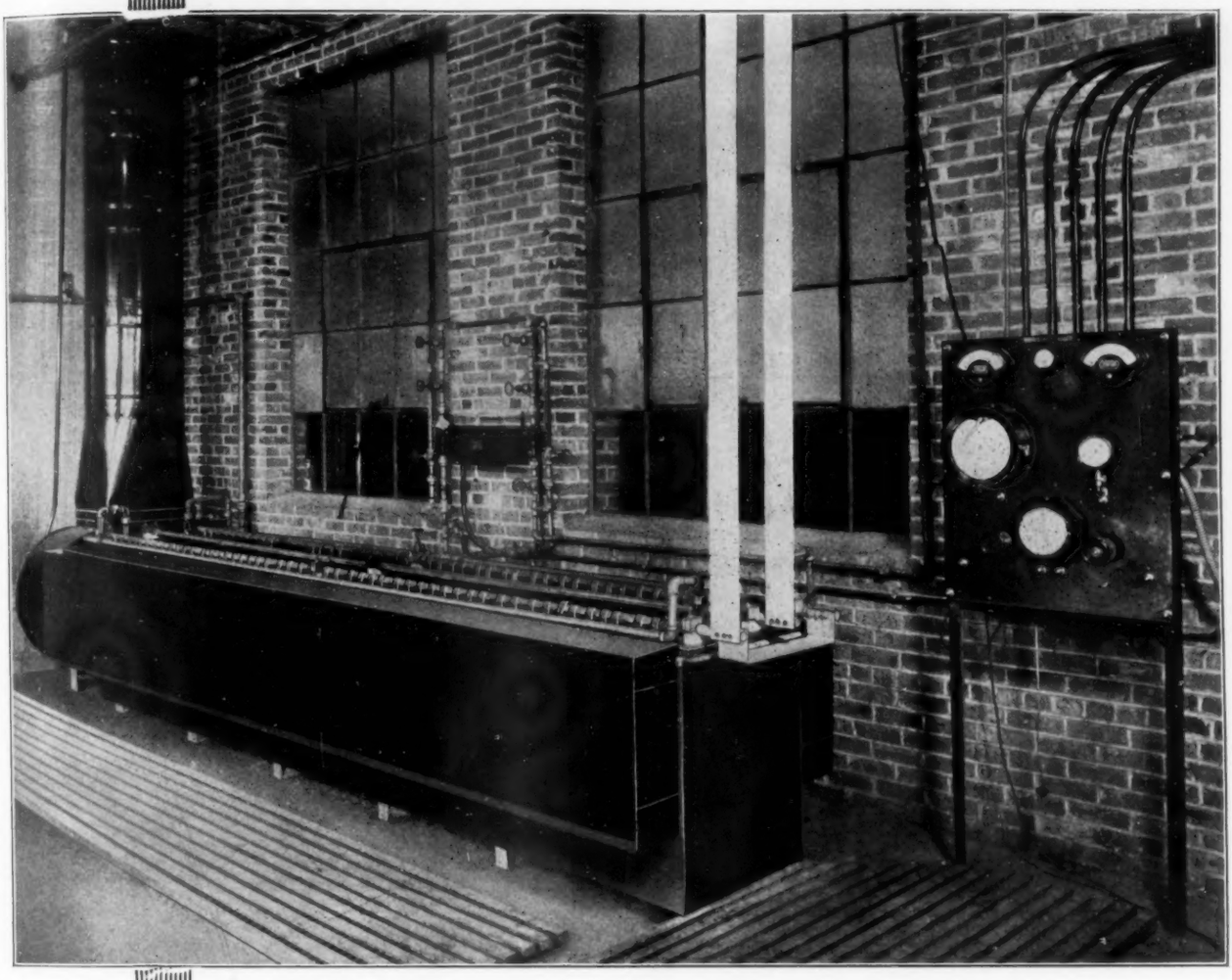

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